

WIN



- A MACBOOK AIR NOTEBOOK
- 5.1 LG HOME THEATRE SYSTEMS

MAY 2011

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Popular Mechanics

EXTREME

HOW-TO

CONSTRUCT A PULSE JET

ROLL A STUNT PLANE

MAKE ROCKET FUEL

CATCH A 50-KILO FISH

**BUILD A
CUSTOM CAR**



LAUNCH A CAMERA
INTO SPACE



**TAKING ON
CHRONOLOGY**

Could the Large Hadron Collider be a time machine?

4G Your early adopter's guide

THAT'S ENTERTAINMENT!

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Know yourself. It's all in the genes.

If you have never tuned in to that fascinating BBC television series, "Who do you think you are?", you've been missing a treat. It follows all manner of celebrities as they explore their ancestral history, uncovering amazing (and occasionally sad or disturbing) stories, adding new branches to their family tree and experiencing a feeling of *belonging*.

This got us thinking. Whereas family networks, parish records, dusty archives and the all-knowing Internet remain essential components of genealogical research, what about the genetic record? What if our readers wanted to go *really* far back, to a time long before written history? Would they be curious about the migration patterns of the ancients, and the maternal and paternal lines that helped create them?

Short answer: of course they would. All of which explains the thinking behind the launch of an unusual competition. Titled "Know Yourself", it offers one female and two male PM readers an opportunity to have their DNA analysed by the Texas-based company, Family Tree DNA.

Acknowledged as a world leader in genetic genealogy, with a database ranked as the largest of its kind in the world, Family Tree DNA will conduct the Y-DNA37 and mtDNAPlus tests for the two male winners to identify the deep ancestral origins of both their maternal and paternal lines, using samples provided via simple test kits. Depending on the uniqueness of the sample tested, the results will also point towards a more recent geographic region or country of origin.

The female winner will receive just the mtDNAPlus test, which identifies the deep ancestral origins of the direct maternal line only, without influence from other lines. Once again, depending on the uniqueness of the sample tested, the analysis may determine a more recent geographic region. All winners will have the choice of pooling their data and joining an international network of genealogical researchers. They might even discover long-lost relatives

where they least expect them.

What do DNA tests have to do with South Africa's foremost science and technology title? Hey, it's what we do – and with your participation, we could go on a very interesting journey. Visit page 74 and submit your entry today.

Our cover story this month, "Extreme how-to", introduces a bunch of people who eat challenges for breakfast. Take Ezra Dyer, whose self-built Rally Fighter is a go-anywhere mean machine that pumps out more kilowatts than half a dozen sensible family cars. Then there's US aerobatics champion Kirby Chambliss, who flies three times a day, six days a week, and is quite happy doing it upside down. Larry Cottrill builds small and extremely noisy pulse jets (he reckons he can put one together in 8 hours), and MIT students Justin Lee and Oliver Yeh think it's cool to launch a helium balloon with onboard camera into the stratosphere. (They're right; it's very cool.)

We salute these people and everyone else who believes that logic and common sense are not essential attributes for the successful innovator and adventurer. In fact, one PM staffer is so inspired that he is about to build his own jet boat, using a high-pressure water pump (powered by a petrol engine, and originally designed for fire-fighting) mounted aboard an ageing dinghy. He fully expects to get wet in the process, but hey, you get wet in the shower.

Alan Duggan

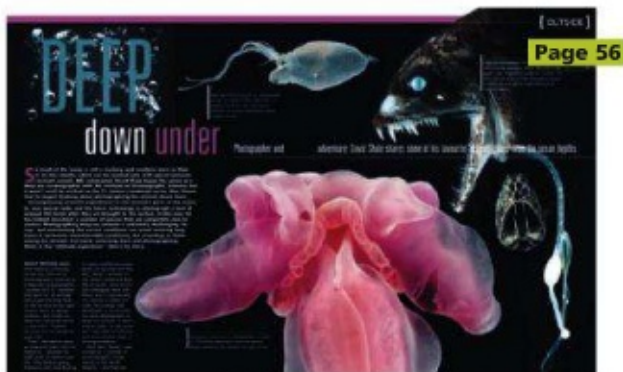
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Page 26



Page 62



Page 56



Page 21

COMPETITION WINNERS...

Details online at www.popularmechanics.co.za



26

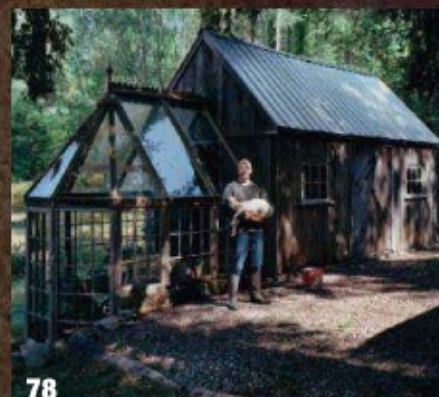
Cover: DIY takes on an entirely new meaning with our guide to the most extreme tasks and skills known to man. Seriously. Photograph by Michael Edwards. Prop styling by Terry Lewis, grooming by Spring Super, wrench built by Constructive Display. This page: US National Aerobatic champion Kirby Chambliss with his Zivko Edge 540 stunt plane, for which he has boundless admiration. Picture: Garth Milan/Red Bull Content Pool.



60



56



78



18

WIN



↑
MacBook Air netbook and DVD drive worth R9 000 -plus (see page 68)

4 DNA tests that → will reveal your ancestral origins (see page 74)



8 LG Home Theatre → systems (see page 71)



8 Dremel Multi-Max tool ↓ sets worth R2 259 each (see page 42)



[SCIENCE]

- 12 Tech watch**
- Snipers go solo with One Shot
 - Shuttle programme wraps up
 - Subs: run silent, run invisible
 - Gimme shelter (just in case)
- 50 Tackling time's arrow**
Could CERN's Large Hadron Collider be the first time machine?

[TECH]

- 41 Digital clinic Q&A**
- Next wave of 3D TVs
 - Zoom stuck? It happens
- 62 Your 4G early adopter's guide**
What does this tech term really mean?
- 72 Invisible brains**
How embedded computing will change our world

[FEATURES]

- 26 Extreme how-to (Cover story)**
- Stunt-jump a car
 - Build a pulse-jet
 - Roll a stunt plane
 - Launch a space camera
- 52 The antisocial network**
How criminals leave clues (and cops log on)

[OUTSIDE]

- 56 Deep down under**
BBC cameraman shares his deep-sea "eccentricities"

[WHEELS]

- 44 New on the block**
- Brio in the DNA: Alfa Romeo Giulietta
 - Well screwed together: Citroën C4
 - Snappy shifter: Toyota Verso CVT
- 60 Jay Leno's garage**
Almost the future
- 84 Car clinic Q&A**
Running on empty
- 86 Saturday mechanic**
Torque wrench basic

[IN FOCUS]

- 66 That's entertainment**
- Turn on, tune in with Live Hub
 - Serious sound, very serious price
 - LG's new TV: yes, bigger is better

[HOME]

- 78 Super sheds**
Can these outbuildings actually be attractive? Oh yes...

[MONTHLY]

- 1 Editor's notes
- 4 Contact us
- 7 Letters
- 10 Time machine
- 18 Great stuff
- 76 This is my job
- 104 Do it your way



44



12



50



62

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PUBLISHED BY: RamsayMedia (Pty) Ltd
 Chairman: Alan T Ramsay
 Managing Director: Stuart Lowe
 Directors: Jacqueline Lahoud, Terry Moolman, Gordon Utian, Brian
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FOR OUR CURRENT SUBSCRIPTION RATES, SEE PAGE 86



Total monthly sales: 41 967 (October to December 2010)



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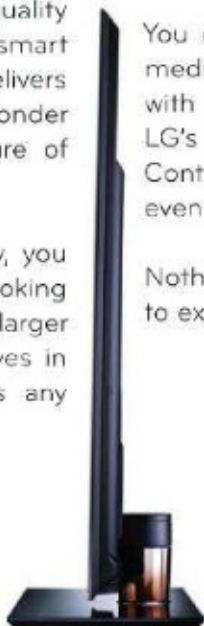
With full HD resolution on a FULL LED display, you would be forgiven for thinking you were looking at colourful paintings at an art gallery. The larger screen size allows viewers to immerse themselves in a 3D experience that's every bit as good as any cinema screen.

But more than just a larger, clearer screen, this state-of-the-art TV is also fitted with LG's latest smart technologies. It's easier for viewers to enjoy video streaming from YouTube, photos via Google's free web photo service, Picasa and so much more.

You can even wirelessly access files stored on other media devices and enjoy them on the big screen with the smart DLNA function. What's more, with LG's intuitive and easy-to-use Magic Motion Remote Control, all of LZ9700's functions are easy to find and even easier to operate.

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IN PURSUIT OF INVISIBLE CAMERAS

Without getting into a debate on legal technicalities or being crucified as a *de facto* criminal, I dare to speculate that there might be other law-abiding citizens sharing this thought: is there technology out there that could counter camera speed fines – that is, make your number plate invisible to a speed camera?

It seems to me that it does not matter how hard one tries to obey road rules, one still gets speeding tickets in the post from some obscure municipality in the Karoo claiming that you did 93 km/h in an 80 km/h zone (or whatever). I have being caught only once for speeding by a manned speed trap the past decade and paid for my sins (72 km/h in a 60 km/h zone – R500) but I am rather sick and tired of subsidising corrupt municipal officials and their bankrupt budgets by being tricked by a network of dodgy hidden speed cameras! So from a purely technological perspective, does PM know of a product or system that would “hide” a number plate from a camera? Great magazine; keep up the good work!

IGNATIUS DE WET
STEYNSVLEI



Editor's note: Okay, we'll skip the lecture on speeding and responsible citizenship, and try to answer your question. We know of a spray product that supposedly produces a glare capable of fooling the camera, and we've actually seen a pick-up equipped with a three-sided revolving number plate: it's presumably brought into action in areas where speed cameras lurk. However – and this is a serious point – you need to know that if you're caught pulling this kind of stunt, the cops will probably throw the book at you (a charge of “defeating the ends of justice” would appear likely).

Write to us, engage us in debate, and you stand to win a stainless steel Festina chronograph worth R1 950. Water-resistant to 100 m, this stylish timepiece features a rubber strap, a black and yellow dial, and serious cred in the sporting community (Festina is official timekeeper of the Tour de France, the Tour de Suisse and the Tour de Romandie). For more information, contact S Bacher & Co on 011-372 6000 or visit www.sbacher.co.za

Send your letter to: Popular Mechanics, PO Box 180, Howard Place 7450 or e-mail popularmechanics@ramsaymedia.co.za Please keep it short and to the point. Regrettably, prizes can be awarded only to South African residents.

WINNING
LETTER



Space invaders

Your article about surveillance by our various items of consumer tech (“How your gadgets spy on you”, March issue) refers. I have become acutely aware of this phenomenon over the past few months, and although I don't believe anyone is spying on me, I am certainly not happy about the intrusion on my privacy.

A case in point: only yesterday I encountered a new form of personal space invasion when I updated the maps on my GPS and found that the related Web site had automatically called up my Facebook page. Okay, it required my opt-in to proceed, but I still find it cheeky. Then there are the targeted ads from Google and other companies that arrive when I perform searches or simply visit their sites. I'm aware that it's a clever and highly lucrative business model, but I also know that this technology is mining my browsing history and heaven knows what other personal information.

TOBY GOODE
DURBAN





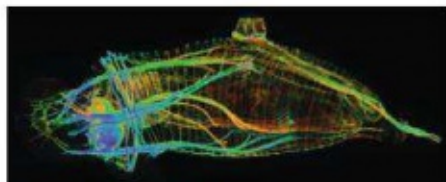
Misnomer?

Over the years, I have enjoyed many opportunities to read *POPULAR MECHANICS*. However, due to budgetary constraints, this has happened mostly in doctors' waiting rooms or business receptions. I was over the moon when my son gave me an annual subscription to PM as a Christmas gift, but my joy has since turned to disappointment because I find that the articles are to a large degree related to electronics, information technology and automotive reviews. In fact, the magazine's title should rather be "Popular Electronics".

I am a BBC (Born Before Computers) and as such find little interest in most of the current content – perhaps because it's out of my league. I would much prefer truly mechanical articles, which used to be the case and is in line with the magazine's title.

PETER WEBER
CENTURION

Editor's note: Quite a few of us were "born before computers", but that's no excuse for failing to embrace them. At PM, we need to move in tandem with the changing tastes and interests of our readers while keeping pace with rapidly advancing technology. Our early editions carried articles on fixing ploughs and tuning carburettors; you would hardly expect us to continue in that vein. As for our title, it's worth noting that in this case, the word "mechanics" refers to the way things work – including electronics and IT.



Reader's ultimatum

Let's have more "Art through the microscope", please! (Refers to a photo feature in the April issue.) These tiny organisms are beautiful and fascinating, and I am sure your other readers would like to see



Whence the bikes?

We have not read much about motorcycles in *POPULAR MECHANICS* during the past year or so. As members of South Africa's vibrant biking community, we strongly urge you to address this. After all, there's no shortage of material.

MONICA AND PETER VAN RENSBURG
WORCESTER

Editor's note: Happy to oblige. We'll be introducing some unique and exciting machines in the coming months. For starters, check out the innovative Zero XU electric motorcycle, which comes with a removable power pack for easy charging. Think absolute silence and instant torque from zero rpm.

more of the same. If you don't deliver the goods, I'll visit your offices and infect you with *Phascolosoma agassizii*.

N CONRADIE
PORT ELIZABETH

Editor's note: So you're threatening us with a peanut worm? Intimidation aside, we'll consider your request.

Of frights and F1

Mike Beachy Head is clearly a talented and resourceful man, as evidenced by his development of Thunder City and now an innovative F1 powerboat engine ("Smoke on the water", March issue). I wish him the best of luck in his dealings with the international powerboat industry, which gives new meaning to cut-throat. Or is F1 powerboating different?

Meanwhile, I hope he hasn't lost his devil-may-care attitude to flying. I have vivid memories of the time he "buzzed" a farm dam near Elgin in one of his jets. I was asleep in a rowing boat at the time, and thought it was Pearl Harbour all over again.

MIKE DELAHUNT
DURBANVILLE

Okay, so what happened to Adam?

I enjoyed your article, "The naked gene" (April issue), and the provocative questions arising from it in terms of our longevity, privacy and other issues. Now I would like to ask a question relating to our far-distant common ancestor: if all living humans are descended (on their mother's side) from

the so-called "Mitochondrial Eve", what can you tell us about her husband?

MARTIN VAN RENSBURG
ORANJEZICHT

Editor's note: If you're thinking of Y-chromosomal "Adam", the most recent common ancestor through the male (patrilineal) line, you need to know that they didn't meet or mate – mostly because Eve lived (probably in East Africa) – about 200 000 years ago, and died anything from 50 000 to 80 000 years before Adam was born. For the record, she was not the only woman alive at the time!

PM

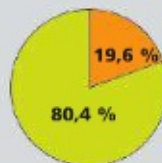
MONTHLY POLL

Geosocial networking services such as Foursquare can pinpoint your exact location and broadcast it. What are your thoughts on this?

I'm all for this – it becomes easy to find friends who have done the same. 19,6%

I'm not keen. It's possible to hijack info from geosocial services, which devalues your privacy and could be dangerous. 80,4%

Conducted online at www.popularmechanics.co.za – visit PM's Web site to vote in our current poll.





Sheer
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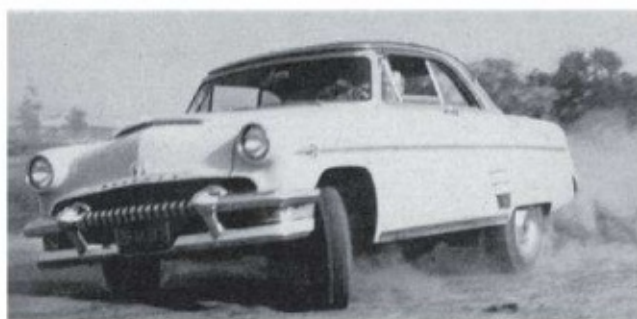
The new BMW X3 is available in xDrive20d Auto and xDrive35i Auto.

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BMW EfficientDynamics

X3 xDrive20d

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1954 MAY

Motoring correspondent Floyd Clymer waxed lyrical on the hill-climbing ability of the 1954 Mercury during his off-road test drive – which was somewhat surprising in the light of the car's formidable rear overhang. He was equally enthusiastic about the Mercury's suspension (see picture), commenting: "Corners can be taken at high speeds with little body roll." Er...



1943 MAY

Our article on the myriad uses of paper was informative and interesting, but we find it notable primarily because of the person who provided several of the accompanying images – the renowned photographer Margaret Bourke-White. (Hey, even celebrated artists need to earn a living.)



1972 MAY

Acknowledging the willingness of DIY guys to build and fly their own aircraft, this month's cover story showcased a variety of flying machines, from a scaled-down World War II Mustang fighter to a two-seater helicopter. By the time we ran this article, there were already thousands of homebuilt aircraft in America's skies (and quite a few in South Africa, too).

1962 MAY



Unfazed by the constraints of logic and aesthetics, we presented this poolside grotto designed by Mrs Robert O'Donnell (as far as we know, "Robert" was her husband's name). It featured a natural-stone backdrop, a roof of tasteful reinforced concrete (incorporating a nozzle) and a religious shrine. PM



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PERSONAL NAVIGATION

Dead-reckoning footwear

The satellites of Global Positioning Systems are often unavailable when users need them most: in mountain valleys, in subterranean caverns and in urban canyons where tall buildings block signals. To help people in these situations, DARPA- and US Air Force-funded engineers at Carnegie Mellon and North Carolina State universities have developed a tiny radar that attaches to a shoe and measures the distance between the heel and the ground.

Coupled with an in-shoe accelerometer and gyroscope, the radar reports how far the user has walked in each direction. Without the radar, the accelerometer would lose accuracy every time the shoe stopped moving. The researchers envision the system integrated into military survival equipment – for example, helping downed pilots navigate to safety – and into gear for adventure sport enthusiasts and first responders. – ALEX HUTCHINSON

QUICK HITS



OF LICE AND MEN

→ Since fabrics don't leave a fossil record, archaeologists can't pinpoint when humans began to wear clothes. University of Florida scientists answered that question by sequencing the DNA from two types of lice. Body lice (*Pediculus humanus humanus*) evolved from head lice (*Pediculus humanus capitis*) after humans began to dress. By determining the timing of this genetic split, the researchers found that clothes first appeared in Africa as early as 170 000 years ago – roughly at the rapid onset of an ice age. Clothed, humans were able to leave the continent for colder climates. – AH

KILLER PAPER

→ Russian and Israeli scientists have invented a new potential weapon in the fight against food poisoning – a paper wrapper that can kill bacteria. They exposed laboratory populations of *E coli* and *S aureus* to paper coated with silver nanoparticles. The particles blasted through the bacteria's cell membranes, killing up to 99,9 per cent of the populations in just an hour. – SARAH FECHT

IN THEIR OWN WORDS

It's becoming quite accepted that we're not going to make it back to the Moon before the Chinese. BUZZ ALDRIN, Apollo 11 astronaut

BATTLEFIELD ADVANCES



Snipers go solo

→ Military snipers do their job in pairs: one shooter pulls the trigger while a spotter watches the result of the first shot to adjust a second. A new system called One Shot, built by Lockheed Martin, replaces the spotter with a laser system that reads the factors influencing a round's trajectory. One Shot analyses the laser's reflection off particles in the air, such as moisture or dust, to determine wind speed and direction. That data, and information on temperature, humidity and atmospheric pressure, are fed into the spotter scope's processor. The crosshairs in the optical scope shift to reflect the changing conditions. Field tests begin in July. – JOE PAPPALARDO

AEROSPACE HISTORY

Shuttle's end

The US space shuttle programme, which comes to an end in June, leaves a complicated legacy. No other craft has carried as many crew and as much cargo as the fleet of space planes, but they fell short on promises to lower launch costs. Expensive upgrades, a lapsing mission rate and two fatal accidents mar the shuttle's record.

"People don't recognise what an incredible piece of equipment and engineering the space shuttle was," says Mae Jemison, an astronaut who flew on *Endeavour* in 1992. "The magic left after the *Challenger* disaster. We started thinking it's dangerous and stopped thinking we could do difficult things." *Atlantis* is scheduled to perform the final mission, resupplying the International Space Station (ISS). Nasa will then buy seats on Russia's Soyuz spacecraft to get astronauts into orbit; US private companies have been tapped to deliver cargo to the ISS. – ALYSON SHEPPARD

FLEET

5 space planes

Columbia, Challenger, Discovery, Atlantis and Endeavour

FIRST DELIVERED

March 1979,
Columbia

EXPECTED LAUNCHES

500

ACTUAL LAUNCHES

135

TOTAL FLIGHT TIME (AS OF JANUARY 2011)

1289

days, 36 minutes, 29 seconds

SHUTTLES LOST

2

(*Challenger*,
1986;
Columbia,
2003)

TOTAL PASSENGERS/ CREW

836

ROLLBACKS FROM LAUNCHPAD

19

REASON FOR DELAY

Mechanical 10
Weather 5
Payload 2
Bird damage 1
Hail damage 1

FATALITIES

14

FAILURE RATE

1 in every
67,5
missions

RATE OF SOLID FUEL CONSUMPTION DURING TAKEOFF

299 371 kg
per minute

RATE OF LIQUID FUEL CONSUMPTION DURING TAKEOFF

170 000
litres of
liquid hydrogen
per minute

64 000
litres of
liquid oxygen
per minute

SPEED IN ORBIT

28 000 km/h

TIME TO ORBIT

8,5 minutes

G-FORCE AT LAUNCH

3 G's

LANDING SPEED AT TOUCHDOWN

354 km/h



"The vast majority of the shuttle programme was a success. We learned so much about how a reusable spacecraft interacts with its environment, how it ages – and what to design next time."

– COL. EILEEN COLLINS, two-time shuttle commander and member of NASA's Advisory Council

ON THE WEB > Visit www.popularmechanics.co.za to find out more about the construction of the world's largest neutrino observatory (including video).



■ EYE ON THE UNIVERSE

Icy observatory goes online

Scientists from 10 countries are celebrating the completion of their massive, R1,9 billion IceCube Neutrino Observatory, located beneath nearly 1,6 km of ice at the South Pole Station in Antarctica. Led by the University of Wisconsin-Madison, the National Science Foundation-funded team drilled 86 holes in the ice. They then lowered a string with 60 sensors into each hole to detect rare collisions between neutrinos from the farthest reaches of space and water molecules locked in the

ultra-transparent polar ice. The researchers hope to learn more about the black holes and neutron stars where some of the neutrinos originated and also search for hints of elusive dark matter. – ALEX HUTCHINSON



Engineers used an enhanced hot-water drill to bore through 2 km of ice every two days.

■ NAVAL TECH

Run silent, run invisible



A SUBMARINE'S BIGGEST ASSET IS ITS ABILITY TO REMAIN ELUSIVE. BUT AS POTENTIAL FOES ACQUIRE BETTER DETECTION EQUIPMENT, THE US NAVY MUST CONSTANTLY DEVELOP NEW WAYS TO HIDE SUBS. – AH

1. Lurking in the shadows

Squid, octopus and cuttlefish have light-sensing proteins called opsins that adjust the animals' skin patterns to match the light and colour around them. A joint team of university researchers, working with the Marine Biological Laboratory in Woods Hole, Massachusetts, and the Office of Naval Research, is developing nanomaterials that, like opsins, can sense light and rapidly change colour to defeat detection by satellites, aircraft or on-deck observers.

2. Sonar stealth

Engineers at the University of Illinois have built an acoustic cloaking device that guides sound waves around an object, making it invisible to sonar. The disc prototype is grooved with concentric rings that capture incoming sound waves and send them into a spiral instead of bouncing back toward their source, which means there's no sonar echo. Another potential use: creating filters that reduce interference during medical ultrasound imaging.

3. Masking invisible waves

The magnetism of a sub's hull increases as it moves through water, leaving a signal that airborne sensors, mines and torpedoes can use to target it. Every year, the US Navy erases these magnetic signatures by running high electrical currents through copper cables strung across subs' hulls. Now, Navy engineers are building a "drive-in" facility in Hawaii with a permanent frame and wiring that can demagnetise the hulls quickly. The facility opens in 2013.

Let the fake blood flow

Scientists at the University of North Carolina (UNC) have overcome one of the key barriers to producing synthetic blood. Red blood cells are soft, which allows them to squeeze through narrow blood vessels and tiny pores. But so far, man-made blood particles created from polymers have been too stiff – they quickly get stuck and are filtered out of circulation. The UNC team is using ultra-flexible hydrogels to make particles that could navigate the human body, transporting oxygen. The researchers also hope to adapt the hydrogels to deliver nanodoses of drugs throughout the body.

Gimme shelter

The demand for well-stocked fallout shelters has receded since the end of the Cold War. Today, another nuclear risk looms – a terrorist cell detonating a single nuclear weapon in a major city – and it requires different preparedness. In 2010, the US government released a 130-page publication designed to help local officials plan for the explosion of a 10-kiloton weapon. The publication instructs survivors (anyone outside the blast radius) to shelter where they are, preferably in a basement or other underground space.

It recommends waiting at least 12 hours before emerging; fallout drops by 90 per cent within seven hours of detonation. However, not all experts agree with the shelter-in-place campaign. Joseph Cirincione, the author of *Bomb Scare: The History and Future of Nuclear Weapons*, says firestorms could turn such shelters into coffins. "The only true defence against a nuclear attack is to prevent it from happening in the first place," he says. – SHARON WEINBERGER

LIVING ROOM TO FALLOUT SHELTER

✓ A basement or underground area is the best location to hide from nuclear fallout, but what if you're stuck aboveground? Janet Liebsch of Fedhealth, a Tucson-based publisher of disaster guides, says people in that situation should build an "expedient shelter". Here's how:

Step one:

Find a solid table, desk or workbench that is tall enough to fit survivors and supplies.

Step two:

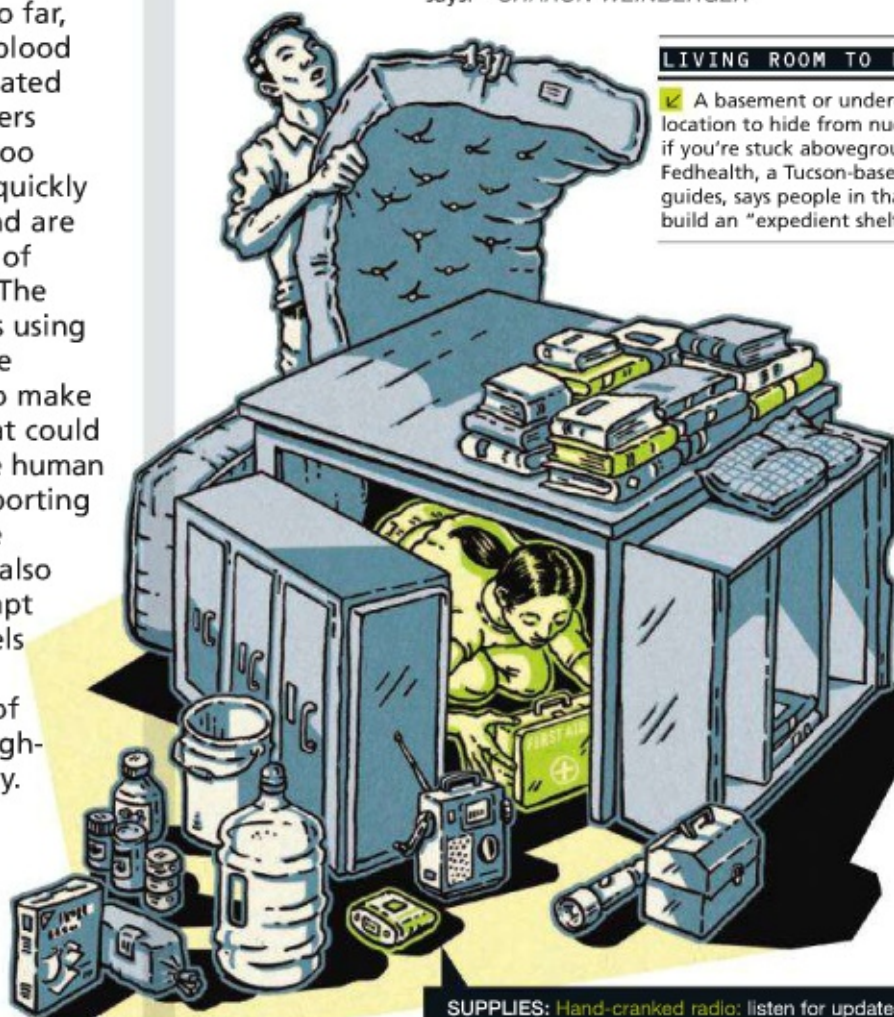
Surround it with shielding, such as books, mattresses or furniture. A few centimetres of protection is enough to block radiation.

Step three:

Gather your supplies in the shelter. Don't go overboard – you may need only 12 hours' worth.

Step four:

Block the entrance, but include two small vents for air.



SUPPLIES: Hand-cranked radio: listen for updates on fire and radiation risks. Bucket: use for personal sanitation. Medicine: fill prescriptions so that you always have a few days' worth. Food: opt for snacks and bottled water. Dosimeter: emerge when the pen-sized device detects low ionising radiation; a safe level depends on how long it will take to find new shelter. Paranoid? We have no idea what you mean.

MEDICAL FRONTIERS

Brain Games

RESEARCHERS CONVERT THE CLASSIC VIDEO GAME, TETRIS, INTO AN INSTRUMENT THAT PROBES THE HUMAN MIND. — OLIVIA KOSKI

Last year, Oxford scientists used the computer game Tetris, in which players guide geometric shapes called tetrominoes into place as they fall, to explore how the brain can be manipulated to protect trauma victims from terrifying flashbacks. In fact, scientists have been using Tetris to probe the secrets of the brain for nearly 20 years. So what makes it such a good tool for neuroscience?

"It has a simple set of rules," says Richard Haier, a psychologist who first stumbled across the game in a software store in 1991. "Yet every move requires a complex combination of concentration and attention, visual and spatial processing."

THE STUDY

Can intervention prevent symptoms of traumatic stress?

PLoS ONE, 2010



THE METHOD

Oxford scientists exposed 60 volunteers to gory films. Afterward, one-third played Tetris, one-third sat quietly, and the rest played computer trivia games.



THE RESULTS

The Tetris players experienced fewer flashbacks than both of the other groups. This implies that a visual-spatial task, which competes for the cognitive resources required to make mental images, may prevent the development of involuntary memories directly after a traumatic event.

THE STUDY

Does practice make the brain more efficient?

BMC Research Notes, 2009



THE METHOD

A team led by Richard Haier (and funded by Blue Planet Software, the license holder for Tetris) conducted a study involving 26 teenage girls; 15 played Tetris for 1.5 hours a week for three months.



THE RESULTS

MRI scans showed that the brain function of Tetris players became more efficient over time than the control group's. Scans also showed increased cortical thickness in multiple areas, providing evidence that the brain's structure can change with stimulation.

THE STUDY

Can taking action reduce the need for internal computation?

Acta Psychologica, 2008



THE METHOD

Paul Maglio of the IBM Almaden Research Centre in California led a series of experiments in which subjects were shown previews of tetrominoes before playing Tetris.



THE RESULTS

Players reacted more quickly during Tetris when they saw multiple orientations of shapes prior to playing the game. This supports the theory that actions taken in the external world can help the brain process information more quickly, improving performance.

TECH CULTURE

Tricks of the train



→ The bulk of the action in the movie *Source Code* takes place on a doomed commuter train. There, US Army pilot Colter Stevens (Jake Gyllenhaal) must repeatedly re-live, through a computer program called the Source Code, the last 8 minutes of a dead man's life in order to discover who placed a bomb on the train – and prevent a second tragedy. Director Duncan Jones and his crew considered shooting on a moving train, but realised that this would limit the director's ability to control the camera angles. So the Montreal-based crew built half of a double-decker carriage and mounted it on a pneumatic platform programmed to mimic the movement of the real thing.

"The downside was the noise of the compressor," Jones says. "But we kept it outside the studio." The set was designed for easy deconstruction and assembly. "When we wanted to shoot the other side of the train, we'd re-dress it," he says. "That allowed us to move the cameras in ways that wouldn't have been possible on a real train." Beyond the set was green screen, which filmmakers later filled in with footage shot in Chicago, carefully matched to the camera angles shot on set. — ERIN MCCARTHY PM

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*SMS charged at standard rates (free SMSs do not apply).

CREATIVE TECHNOLOGIE



GREAT STUFF

From home improvement to outdoors, wheels to electronics, here's the newest gear you'll want to own.

COMPILED BY SEAN WOODS
seanw@ramsaymedia.co.za

Smarterphone →

We know that, being a PM reader, you're probably an early adopter. So we're pretty sure of your intense interest in the fact that the just-launched BlackBerry Bold 9780 smartphone is the first of the company's models to come with the new BlackBerry 6 operating system. So what's the big deal?

To name just three things, advanced multimedia, enhanced messaging and easy access to social networks.

Although retaining familiar BlackBerry features, the new operating system integrates a new, powerful WebKit-based browser that renders web pages quickly, navigates fluidly, includes tabs for accessing multiple sites simultaneously and provides an intelligent zoom. One particularly handy new feature is a universal search that enables a more effective searching of the phone as well as the ability to extend the query to the Internet.

Connectivity includes 3G, Wi-Fi and GPS for location-based applications.

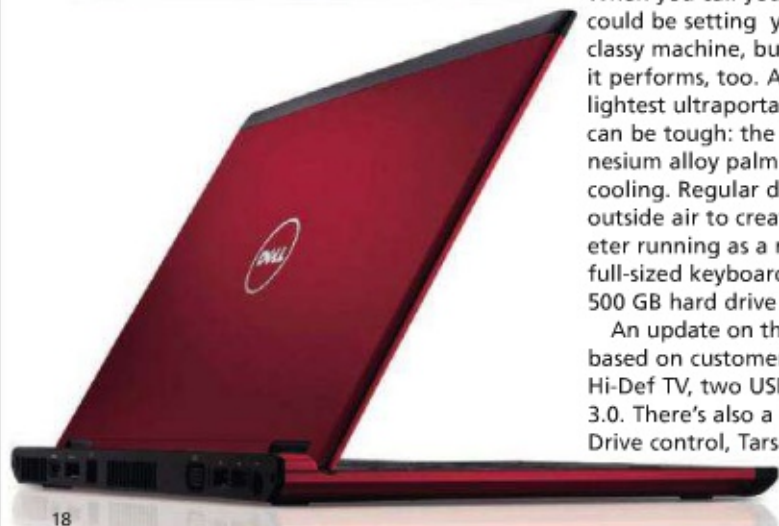
Available in black or white, the Bold 9780 costs about R4 700 at Vodacom outlets.



← MORE THAN JUST SKIN DEEP

When you call your product the world's most beautiful business laptop, you could be setting yourself up for a fall. Dell's Vostro V130 is an undeniably classy machine, but road warriors and power users will want to know how it performs, too. At 17 mm thick, the Vostro V130 is one of the thinnest and lightest ultraportable 34 cm laptops designed for small business. But sleeky can be tough: the aluminium shell boasts reinforced zinc hinges and a magnesium alloy palm rest. It's also the first ultra-thin model to offer hyperbaric cooling. Regular designs simply push hot air out; hyperbaric cooling sucks in outside air to create a convection effect, boosting cooling and allowing quieter running as a result. Hardware includes a new Intel Core ULV processor, full-sized keyboard and 34 cm high-definition WLED display, 500 GB hard drive and 4 GB of ram.

An update on the popular V13, the V130 includes new connectivity features based on customer feedback. These include an HDMI port for connection to Hi-Def TV, two USB 2.0 ports, shared USB/eSATA port, Wi-Fi and Bluetooth 3.0. There's also a SIM card slot and upgraded webcam. Available through Drive control, Tarsus and Pinnacle, the Vostro V130 starts at R10 999.



JUST CHILL ↓

Whoever invented the term laptop clearly didn't spend much time with one of these portable heaters on their laps. To help you keep your cool – and the laptop's – while you're working on that thesis or taking on *Tron*, the Belkin Cooling Lounge combines a soft cushion and a quiet cooling fan. Fact is, not only will the cooling effect benefit you, it will also help prevent your machine overheating, which could cause component damage and shorten service life.

A unique wave design circulates airflow around the laptop, pulling cool air in from the front and sending hot air out the sides. Urban warriors will be glad to know that it fits into a standard laptop bag. Price: R799. Enquiries: Spectrum Multimedia, (011) 807 0707.



ULTIMATE CLARITY ↑

Next time you're admiring the size and clarity of your big-screen TV, ask yourself if it's as good as you think it is. Could it stand comparison with the kind of hardware used by the pros? Like NEC Display Solutions' new Spectraview Reference 301 Pro Monitor, a flagship 75-cm model that completes an award-winning display range for colour-critical applications.

The Reference 101 is expected to become an industry benchmark. The monitor, which can be hardware-calibrated, features a true 10-bit P-IPS (professional in-plane switching) panel. It reproduces 1,07 billion colours.

In terms of size, resolution and uniformity, the Reference 101 is ideal for the most demanding pre-press and soft-proofing applications, as well as for professional colour-critical image and video editing. Its advanced connectivity options (two DisplayPorts and two DVI-D interfaces) guarantee flexibility, too.

Price: R38 699; for more details, visit www.nec-displays.co.za or call NEC on (011) 918 6449.

← EXTREME VIEWING



To birdwatchers comfortably ensconced in a hide or a vehicle, first-class optics top the list of their binocular requirements. People on the move, though, are likely to want binoculars that can take a hammering. It's the latter group who would be particularly interested in a new model that Nikon has added to its popular ATB binocular series: the Prostaff 7. The new model comes in two formats – 8 x 42 and 10 x 42. Both offer phase-correction-coated roof prisms and high-reflection mirror coating prisms for bright and clear images, even in low light. They feature long eye relief (15+ mm), turn and slide rubber eyecups and a smooth diopter adjustment. The glass itself is lead and arsenic-free Eco-glass. Best of all, the Prostaff 7 is specifically designed for trekking, nature watching or attending sports events, with a rugged body that's waterproof and fogproof. Price: R1 749 for the 8 x 42 and R1 849 for the 10 x 42. To find out more, contact Foto Distributors at (011) 466 2500 or visit www.nikon.co.za

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THE NEW VALUE FRONTIER



CHARGE WIRELESSLY

From cellphones to laptops and even dry-cell-powered torches, we live in a world of rechargeables. Great for Green credentials and economy, perhaps, but there's a downside: a plethora of charges and their associated cables.

The Powermat avoids the tangle by going wireless. Recharging your cellphone is as simple as placing it on the mains-powered mat, which comes sized for 1, 2 or 3 devices. The phone's battery "door" is replaced with a supplied replacement that contains a receiver

unit. Receivers are available for most popular cellphones; for other kinds of devices, there's a universal Powercube receiver with several adapters. USB charging is also available. The Powermat is well suited to the traveller thanks to a universal power supply compatible with sources from 100 to 240 VAC. Price: typically about R250 to R300 for receivers, R799 for the Powermat and R350 for the Powercube. Enquiries: Platinum Micro on (011) 553 2600; www.platinummicro.co.za



GET PERSONAL AGAIN

Grizzled greybeards fondly remember the hand-cranked telephone and the "nommer, asseblief" from the long-distance operator at the exchange – not for ease of communication, but for the sense of wonder and the personal touch involved in actually getting connected. You might be able to rekindle that with a video call on the GXV3175 touchscreen multimedia IP phone from Grandstream, which perfectly matches today's connected lifestyle.

In addition to making VOIP phone calls, it allows video calls phone to phone, through a PABX, or even Skype. You'd be able to conduct high-quality video conferencing with TV output. The easy touch-and-swipe user interface is accessible via a high-resolution 175 mm colour screen. Built-in infotainment applications include a Web browser with photo album and social network connectivity, plus business productivity tools such as a calendar and phonebook.

Multiple connectivity options range from Wi-Fi to dual network ports (it supports Power over Ethernet), and auxiliary ports. The unit integrates with Grandstream IP cameras for an integrated phone/security solution. Price: R3 572. To find out more, visit Miro Distribution at www.miro.co.za



SNAP AWAY IN STYLE

Canon's Ixus cameras have been as much about style and design as about performance, and the new 310 HS is no exception. Like its predecessors, the 310 HS is more than just a regulation point-and-shoot: for 2011, you'll get superior low-light capabilities, full HD movie capture and manual photographic controls. Design highlights include enhanced 8 cm touchscreen operation and a distinctive stainless steel body.

Canon's HS system (12.1 Mp sensor with DIGIC 4 image processor) combines with a bright ultra-wide angle lens featuring optical image stabiliser help make it easier to capture crisp stills and stunning 1080p video – in a compact package. A vast range of effects and modes put creative control at your fingertips.

Price: about R3 230.

For more details, visit www.canon.co.za



BRING THE KIDS ALONG

Taking your toddler along on your bike rides suddenly became a lot more practical.

The SA-designed and locally built Riksha lets you bike, stroll, jog and enjoy the outdoors as a family while keeping your little one comfortable and safe. It's said to be virtually indestructible. When towed behind a bicycle, its pivoting coupler ensures that it stays upright – even if your bike topples over. The Riksha also easily converts to a stroller.

The Riksha's rollcage design surrounds the child, which is securely strapped in by means of a 5-point harness. Its lightweight aluminium frame, covered in washable water-repellent polyester fabric, rides on 16-inch quick-release wheels with drum brakes and folds flat for easy transport and storage. A weather shield provides shade from the sun and shelter from wind and rain, with zip-off windows, air vents and tinted UV-blocking windows. There's also space to store odds and ends. Total weight is 12,62 kg. Price: R4 200. Enquiries: (012) 657 2389 or visit www.riksha.co.za



ECO MOUSE

Okay, so we all know that mice are biodegradable (the cute furry kind, that is). But what about the computer variety? If we're talking about Fujitsu's Mouse M440 ECO, the answer's a resounding yes. It's made from the environmentally friendly plastic substitutes Arboform and Biograde.

Just because it's green doesn't mean that there's any compromise on quality or functionality. It looks like your average high-quality plastic mouse, with scroll wheel and accurate tracking thanks to the 1 000 dpi optical sensor. Plus, it's said to be more comfortable to use than plastic models because of the elasticity of its Biograde shell, which allows for a more ergonomic design that is focused on user comfort. Price: about R140. Contact Fujitsu on 011-233 5911 or visit www.fujitsu.com/za

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WHAT MEN WANT





KEEP IT TOGETHER

Loose tools rattling around in the back of your vehicle are not only annoying – they can become damage-inflicting UFH (unidentified flying hardware). That's particularly relevant in the rough conditions that off-roaders expect. The SecureTech Tool Organiser is designed to keep everything together, while taking up minimal space. Once packed, the top flap folds down to prevent tools from falling out. Then simply roll it up from right to left and secure it with the attached webbing.

And, unlike a toolbox, you don't have to go scrabbling in the bottom to find what you need. You can access your tools easily – spanners pack in order of size and position, for instance. For longer trips, a second roll could be added, containing extra screwdrivers, pliers and shifting spanner and vice grip. Price: R114 at Outdoor Warehouse and Makro.

YOU DA SCAN MAN

In the good old days, an experienced mechanic could diagnose a car's ills simply by listening closely to the engine or checking the colour of the exhaust tailpipe. Today's considerably more complex automotive technology would challenge the ear of a concert violinist and the eye of a sharpshooter. Fortunately, diagnostic tools such as Snap-on's new Blue-Point Microscan diagnostic platform can do the job – and affordably, too. More than just a code reader, this set-up reads all 10 modes of OBD-II fault codes. Portable and fully plug-and-play, in as little as 10 seconds it's ready to check repairs and road testing, and solve basic engine and drivability problems. Live data graphing allows comparison of two graphs side by side to see cause and effect.

Snap-on's troubleshooter



code tips show the most likely causes for thousands of common vehicle problems. Using an optional OBD-I adapter set, it can diagnose older vehicles. Price: R2 998.

For more information, visit www.snapon.co.za, e-mail enquiries@snapon.co.za, or call 0861-SNAPON.

TRIM ALL ROUND

Despite all you might have heard about the joy of working in the great outdoors, the truth is that toiling away in the herbaceous border wouldn't be most people's first choice of how to spend a sunny morning – or afternoon, for that matter. Well, at least there are ways of minimising the drudgery, a case in point being Framar's lithium-ion hedge shears. This multi-tasker can be used in a range of trimming applications from grass and edges to shrubs and hedges. With a 7,8 mm cutting capacity diameter, it has separate blades (a 120 mm hedge trimmer and an 80 mm grass blade) that can be interchanged at the push of a button.

A telescopic rear handle and adjustable head angle, with up to 180 degrees of rotation, help you deal with hard-to-reach areas. Conversion from precision hand-held pruner to grass and edge trimmer is as easy as clipping on the supplied wheels.

The 3,6-V 1,3-Ah Li-Ion battery charges in 3 to 5 hours. Price: about R390 at leading hardware stores nationwide. For more information, visit www.lgtools.co.za



**FEATURES, NOT FRILLS** →

High-tech peripherals are nice-to-haves in a laptop if money is no object, but real-world users – particularly the corporate type – are more focused on practical performance. Priced within reach of buyers on a tight budget, two new models added to Toshiba's Satellite C Series make no compromises on the kind of features that beancounters prize, such as a choice of AMD or Intel CPU, 8GB of memory and a variety of connectivity options. However, the big difference between these models and other members of the C Series is the big 43,9 cm screen. The embedded webcam with Toshiba Face Recognition enables login without the need to type in a password. All in all, the 670 is the perfect desktop replacement for those who do not see mobility as a key requirement. Prices start at about R7 500 from Mustek; call (011) 237 1000 for details.

**DIY LIKE A PRO** →

To the maxim that you can never be too thin or too rich, there's the lesser known (but no less true) DIYer's corollary: you can never have too many tools. So, although it's aimed at the contractor, there's no reason the Skil Masters combo set 0030MA wouldn't fit right in with the serious home handyman's toolkit. It features four 18V Li-Ion-powered cordless power tools:

- Two-gear cordless drill driver;
- Torch;
- Circular saw with a cutting depth of 41 mm at 90 degrees;
- Reciprocating saw with quick blade change and pendulum hub settings.

The set comes in a sturdy bag along with two 18V Li-ion batteries, a one-hour charger and value-added accessories. Price: R3 499. For more product information, call (011) 651 9858 or visit www.skil.co.za

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PICTURES BY TOM FOWLKS





DEGREE OF
DIFFICULTY



BUILD A CAR

A LITTLE COMPANY CALLED LOCAL MOTORS HAS TAKEN A BIG, RADICAL BUSINESS PLAN – CROWD-SOURCED DESIGNS, MICROFACTORIES, CUSTOMER-ASSISTED MANUFACTURING – FROM THEORY TO REALITY. NOW, WITH ITS FIRST CAR, THE RALLY FIGHTER, ENTERING PRODUCTION, PM GETS BUSY WITH SOME GOOD OLD-FASHIONED WRENCH WORK.

BY EZRA DYER

Degree of difficulty is on a scale of one to 10, with 10 being the most difficult.

HOW TO: BUILD A CAR

The unmistakable feel of metal scraping skin forces me to look down at my right hand. I see blood welling up from the middle knuckle of my index finger. I had thought that the space beside the transmission tunnel of Local Motors' Rally Fighter (think: a street-legal version of Mad Max's desert racer) could accommodate both my hand and a seat track. But it couldn't – at least not while I was trying to wrestle the seat into position and bolt it to the floor – and now I have a slice in my flesh.

I turn to Mike Pisani, one of Local's R&D engineers, and explain that he must have ordered a batch of defective seats. There's no way these fit. He calmly nods toward the other three cars on the line. They all have seats. Which means that if there's a problem, it's not with the hardware but with the goon holding the wrench. Therein lies the beauty and the challenge for Local Motors and its customers: you can't just walk into a dealership and buy a Rally Fighter. You have to roll up your sleeves, grab a ratchet and help build it.

The process that led to my newbie car-building moment can fairly be described as unprecedented. Local Motors CEO John "Jay" Rogers Jr hatched the idea for Local Motors while he was at Harvard Business School, where the concept won the annual Pitch for Change contest during the 2006 to 2007 academic year. Before Harvard, Rogers had served for six years as a US Marine Corps infantry commander. Which means he could kill you with his bare hands, but he'd have to make a business case for it first.



Rogers's big idea is to harness the creativity of underemployed industrial designers, art-school students and car-design geeks – people who have notebooks full of sketches but lack the means to produce a vehicle. But instead of one designer providing a few options, an online mob goes to local-motors.com and submits 10 000 schemes for cars (actually, more than that at last count); the coolest ones rise to the top, based on voting by the LM virtual community. Winners receive \$10 000 (about R70 000) and a childhood dream come true: seeing a car they had drawn go into production. That's how Sangho Kim, a student at the Art Centre College of Design in California turned the wild idea of an off-road P-51 Mustang fighter plane into a rolling reality. "I was totally inspired by the P-51," says Kim, who now works as a designer for GM Korea. "I was searching for what could make a strong, bold and sexy car. The P-51 has a really cool silhouette and American DNA."

After Kim's design had been selected, Local Motors built its first production facility near Phoenix in Arizona, hewing to the company's plan to set up microfactories in whichever area suits a given car. The Rally Fighter's speciality is fast off-roading in the desert, so Phoenix fits the bill. Other designs, not yet in production, include the Green Apple, a compact electric car with a windmill generator and enough get-up-and-go to survive in the Big Apple, and the Miami Roadster, a "modern, hot" car that provides "elegance in an aggressive package", according to LM's website.

Practically speaking, Pisani says,

"There are four major impediments to building a car: tools, time, space and ability." Local Motors takes care of the tools and space. I've got plenty of time. So for my Rally Fighter build, ability is the wild card.

The finished product will be roadworthy, of course, but different from a conventional set of mass-market wheels. Its DIY pedigree and certain details – for instance, it has seatbelts, but no airbags – dictate its registration as a custom- or homebuilt vehicle. If you're thinking kit car, you're on the money. But Rally Fighter buyers don't build the car in their garage; instead, they spend two weekends at the factory, enjoying expert help. The last time I built a car, it was made out of Lego blocks. But, with Pisani's guidance, I'm up for the task at hand. I think.

Pisani leads me to a rolling chassis and ticks off our to-do list: install the aluminium honeycomb boot walls, assemble the bootlid, and fit the body over the steel-tube frame. We'll also deal with my nemeses, the seats. I'm fascinated by the naked Rally Fighter, with its immense Fox Racing remote-reservoir shocks. Although a BMW diesel powered the development car, all the vehicles here on the floor are fitted with a GM E-Rod LS3 V8 crate motor. It's not as novel as the



TIP

At Local Motors, tools are colour-coded for each task and replaced after use. This makes the build process faster and more consistent and prevents tool loss. There's a lesson in this, especially if you occasionally work in a friend's garage: mark your tools and put them back in your kit right away.



THE BUILD



Big tasks, like bolting on the body, are instantly gratifying. The real challenge is adding the small but critical parts (brake lines, wiring, etc), which takes hours.



EXPERT



The biggest hurdle in a DIY project is between your ears. "Don't fret about what you don't know," says John "Jay" Rogers Jr, founder and CEO of Local Motors. "The journey is what's worthwhile, and there's no better education than simply getting started."

ILLUSTRATIONS BY ALEXANDER WELLS

BMW straight six, but it has the advantage of US emissions compliance – and 321 kW to the BMW's 198. In its current, bodiless state, the Rally Fighter shows how it maximises the use of off-the-shelf parts. The rear end is from Ford, as is the steering gear. The fuel tank wears a BMW part number (M3 tank, 63 litres; M5 pump). The front and rear bumper structures are Mercedes. For a car that will cost about R400 000, this thing has some fancy innards.

Our first task is to install the boot walls. That means fitting weatherstripping to the top edges of the panels and then bonding the walls into place with angled aluminium and Plexus adhesive. If you've never used Plexus – and I haven't – the important message seems to be that you shouldn't let it touch two things that you don't want stuck together forevermore. Thankfully, I'm able to draw a tidy bead with the glue gun and get our walls clamped into place without inadvertently gluing my head to the rear suspension. This car-building stuff is easy.

At least that's what I think until I'm tasked with



installing the seats. Each one is mounted on a rail, and the mounting holes play peekaboo depending on the seat's position on the rail. That precipitates a chicken-and-egg conundrum, since you can't easily slide the seat on the rails until it's mounted, but it's hard to mount the seat without moving it along the rail.

As I struggle to get the seat into position, I notice there's a lot of swearing going on around here. And it's all coming from me.

With that frustrating task behind me and my knuckle bandaged, I move on to the rewarding part: dropping on the body. The upper shell – roof, rocker panels and front fenders – is glass fibre; the lower parts that are subject to abuse, such as the bumpers and rear fenders, are carbon fibre. The shell weighs less than 70 kilograms, so Pisani and I easily lift it into place. Next, we tackle the bootlid. Housing the taillights, a latch, hinges, licence-plate lights and the centre brake light, the humble bootlid has a lot going on. And that's before you install it.

Pisani and I attempt to bolt on the hinge brackets,



GLOSSARY

Custom-built (kus'tam bilt) (adj.; n.) Put together from scratch and not mass-produced; any vehicle that meets this description. The Rally Fighter, kit cars and other motorised DIY vehicles fall into this category. In the US, custom-builds require different inspection and registration processes from those applied to, say, a Chevy or Volkswagen. Though not necessarily unsafe or more polluting than mainstream vehicles, custom-builds don't meet government emissions and safety standards before production. This is why a separate set of regulations is applied to the vehicles.

HOW TO: BUILD A CAR



but the holes aren't lining up with the chassis. The boot's weatherstripping is slightly thicker than originally planned, so the brackets are slightly off. Pisani removes a bracket and drills out the mounting holes. Now it fits. "After we finish, we'll take the measurements and change the CAD data so that the next ones will bolt right on," he says. "We could just keep adjusting each one, but that's the hack way to do things."

We move on to the boot wiring, which requires a couple of spots of solder. I confess that I've never soldered anything, and Pisani gives me a quick tutorial. This, too, is part of the process: if there's a technique or tool that's unfamiliar, the Local Motors crew teaches you how to do it. And it turns out that soldering is great fun. You're using fire and liquid metal, which is elementally satisfying.

Come to think of it, the whole procedure is satisfying. You're handling tools and bonding metal, watching a car take shape. But the really difficult tasks are handled by the pros. You get the validation of seeing your work translated into a tangible (and, in this case, fierce-looking) machine, without the fear that you'll get 20 hours into the assembly and then realise that you installed the first component backward. As my workday winds down, the Rally Fighter is a little more complete than it was when we started. It's gone from a naked chassis to something that looks like a car rather than a dune buggy. But it's not yet ready to hit the trails. For that, we'll be using Rogers's own Rally Fighter, one of the first V8 cars to roll out of the factory. That car is finished. Almost.

The next day, I arrive at the factory, a sprawling ex-motorhome warehouse on the outskirts of an industrial park. Engineers Colby Whipple and Alex Fiechter are doing some final transmission calibration on the Rally Fighter that I'll be driving. Our plan is to take it on an off-road shakedown that'll throw us a little bit of everything: high-speed river beds, narrow forest trails and steep climbs. We'll head into the mountains, to Crown King – an old mining town that's still home to 100 hearty settlers – and our ultimate destination, the Crown King Saloon, where we plan on having a celebratory beer and burrito. After we spend the morning and early afternoon adjusting the four-



Local Motors installed a steel ramp outside the factory for monthly stunt shows. Here, the Rally Fighter flies 5 metres in the air.

speed automatic's shift points, the Rally Fighter is packed into a trailer, and we head for the hills.

By the time we arrive at the trailhead, daylight is already fading. Rogers and Fiechter climb into the diesel Rally Fighter while I slide behind the wheel of the V8 car, with Local's chief sales officer, Sarah Stokes, in the passenger seat. Making me feel like a supreme underachiever, Stokes is a very attractive triathlete who was also in the Marines and went to business school at Harvard. Rounding out our posse, Local Motors engineering intern Tony Rivera and our photo crew pile into a Ford Raptor that I brought along on the thesis that it would be the only production vehicle that could remotely keep pace.

We set out on a dirt road that soon deteriorates into a track through a riverbed. I quickly learn to modulate the throttle, because power oversteer is effortless when you're trying to put down 300+ kW on dirt. Donning my car-reviewer hat, I'd go for a steeper rear end to bring up the revs, softer rear springs to encourage more squat, and padding on the roll cage to quell rattles. But the basic package works extremely well, especially in its intended milieu.

Rogers seems to be gunning for the unofficial Lake Pleasant-to-Crown-King world speed record. As a result, I'm lost in a sort of super-focused driving fugue. All of my brain neurons are devoted to processing this experience.

I'm probably drooling. And the Rally Fighter is working brilliantly, its daddy-longlegs suspension soaking up the hits without bouncing us into, for example, an enormous bull that suddenly appears trailside.

After safely passing the livestock, we stop for a break. The V8 Rally Fighter protests the idling with a jet of steam from the radiator. The

HOW TO: BUILD A CAR

fan fuse has blown again. Rogers is confident that if we keep moving, the single-digit night-time temperatures will make the finicky fan a moot point. We get back on the trail, but shortly thereafter I pull up on Rogers's taillights at the start of a boulder field. I assume he's stopped to pick a line, but when I get out to talk, I see that the line already picked him: his Rally Fighter's left front wheel is splayed out at a gruesome angle.

To my relief, Rogers produces a replacement part – the steering-knuckle stud bolt – and then crawls under the car to install it. "We knew this was a weak point on the development car, so we beefed it up on the production cars," Rogers says as he aims a torch at the rogue component. You've got to respect a car-company CEO who can rebuild a front end on the kind of trail that has the desert-hero Raptor creeping along in low range.

The trail opens up, and I challenge myself to try to keep up with Rogers. Every few kilometres the trail forks, so we stop to make sure we don't lose the Raptor. Tony, when he catches up, gives the Ford its due. "With a regular 4x4, this trail takes 8 hours." With a Rally Fighter: 3 hours. The 60 or so kilometres up to Crown King don't come easy.

Before long, the Saloon reveals itself through the trees, an oasis of cold beer beckoning our dusty throats. Two grizzled locals stand on the porch and appraise the alien off-roaders. "You came up from Lake Pleasant," one of them says, "with two-wheel drive?" He says this with an air of disbelief, as if he might call our bluff and climb under the nearest car in search of front halfshafts. The other guy clearly appreciates the Rally Fighter's styling, declaring the car "prettier than a brand-new chainsaw". Okay, perhaps he was actually talking about Stokes. But he seemed to like the cars, too.

I'm just relieved to be here. If either of these two cars had become irreparably broken out on that trail, that would've been my story. And, journalistic impartiality and fear of mountain lions aside, I didn't want that story. Because this is a company you want to root for.

Local Motors' debut product isn't a traditional kit car, but it's not a mainstream production car either. It's more exclusive than many exotics, but it's not outrageously expensive. The Rally Fighter is, in its way, sort of like an off-road, American version of a Lotus – a car that's rare but attainable for mortals, built by a small, focused company of gearheads. And you. **PM**

DEGREE OF
DIFFICULTY



**LEARN TO DO
INCREDIBLE
THINGS WITH
THESE OBJECTS:**
CAMERAS
ROCKETS
AIRPLANES
FISH
BACKHOES
STUNT CARS
PULSE JETS
REDWOODS
ROLL CAGES
HOUSES
BULLS
PLUS: 7 EXTREME
TOOLS THAT
INSPIRE FEAR AND
DESIRE

DIAGRAMS BY CYPHER13

LAUNCH A CAMERA INTO SPACE



- Weather balloon
- Parachute
- Aluminium foil
- Newspaper
- Hand warmers
- Camera
- Antenna

1. Find a site The ideal is a flat, treeless site, at least 150 kilometres from a military base, on a calm, clear day. Give the civil aviation authority 24 hours' notice.

2. Prep the gear Set the camera to shoot automatically at 800 sec shutter speed. Program a cellphone to send GPS co-ordinates after the flight.

3. Pack a capsule Cut holes in a cooler for the camera lens and phone antenna. Zip-tie the cooler to a parachute and balloon.

4. Test; Launch Lee and Yeh tested impact resistance by putting eggs in the capsule and dropping it from a rooftop. They also froze the camera.

MIT students Justin Lee and Oliver Yeh stuffed a camera in a cooler, tied it to a helium balloon, and – with civil aviation authority approval – launched the rig 30 kilometres into the stratosphere. "The results were fantastic," Lee says. They tracked the device with a GPS-enabled cellphone and found it 30 kilometres from the launch site. The 5-hour flight, which cost R1 000 in materials, took photos of Earth every 5 seconds. Then, at 30 000 metres, the balloon popped. See the results at 1337arts.com.

WARNING

Check with civil aviation authorities to prevent launching into restricted flight zones, and check that the payload is within legal limits. Use a balloon-trajectory predictor to make sure the capsule won't fall in a city. "That could be quite dangerous," Lee, above right, says.

Picture by Esdras M. Suarez/Boston globe

BUILD A SUGAR ROCKET

DEGREE OF DIFFICULTY



1 Set Up Sugar-propellant pioneer Jimmy Yawn says one should set up outside with a temperature-controlled pan. Weigh out 50 g Pixy Stix, 100 g KNO_3 , 25 g corn syrup and 100 ml water.

2 Cook Heat at 150 degrees until the solids dissolve. Reduce heat to 110 degrees; cover the pan. When the mix is like putty, roll a 25 mm strand; let it cool. Light it; time the burn. "Good propellant burns 25 mm in 8 to 10 seconds," Yawn says.

3 Launch Load propellant into the rocket.

Note: "Simply stuffing the propellant into a casing does not make it into a rocket motor," Yawn says.



DEGREE OF
DIFFICULTY



ROLLA STUNT PLANE

A snap roll is a high-speed 360-degree rotation of an aircraft on its yaw axis, the line perpendicular to the wings. Five-time US National Aerobatic champion Kirby Chambliss says a snap roll feels "five or six times more intense than the craziest roller-coaster ride". So it's surprising to hear Chambliss, who flies up to three times a day, six days a week, say he could coach the average person to do one in about 30 minutes. "You don't need to be a pilot – the plane doesn't know you don't know how to fly it," he says. "Some pilots are worse at it. They're not used to flying upside down."

WARNING



The plane will be spinning at the rate of about 500 degrees per second. "In a fraction of a second, the world will explode right in front of you," Chambliss says.

"It's common to get stuck flying upside down," Chambliss says, "but the ultimate nightmare scenario would be the wings coming off the plane." That's why he uses an aerobatic aircraft – such as the Zivko Edge 540 – for stunts. "The only way to damage that plane is if it hits the ground," he adds. Crashing also qualifies as a nightmare scenario.

Zivko Edge 540



1. Pull back Get the plane up to 120 knots. Rapidly pull back the control stick to cause upward force on the plane's nose.



2. Stall the wing Step on the right rudder pedal. The left wing lifts and moves forward while the right wing stalls.



3. Level it out Guide the stick forward and depress the left rudder pedal to re-engage air flow to the right wing.



VIDEO

> Visit www.popularmechanics.co.za to watch a video of Red Bull Air Race World Champion Kirby Chambliss performing some unbelievable aerial stunts.

HOW TO

CATCH A 50-KILO FISH

DEGREE OF DIFFICULTY



Charter a boat, drop your hook and wait for a strike. "In the first 5 seconds, you realise you have a live Patriot missile at the end of your line," veteran offshore angler Charlie Levine says. "A good captain shouts, 'Reel! Reel! Reel!' as he turns to chase the fish. With a fish that size, reeling it in can take all afternoon."

TIP



To find the right charter boat, try going online to fishing forums, get a referral and call the captain. A good one will promise little and put you in touch with a previous customer for a testimonial.



KEY TOOL *Fighting Chair:* Bolted to the deck of the boat and harnessed to the rod, the swivelling chair lets anglers brace their feet in footholds and leverage their body weight against the fish.

DEGREE OF DIFFICULTY



OPERATE A BACKHOE

You've wanted a backhoe since age 6. So rent one! Here are the basics of the 7-ton behemoth.

EXPERT



Case Backhoe Rodeo Series champion Nick Market wasn't always a backhoe phenom. "You really need a lot of seat time before you get good," he says.

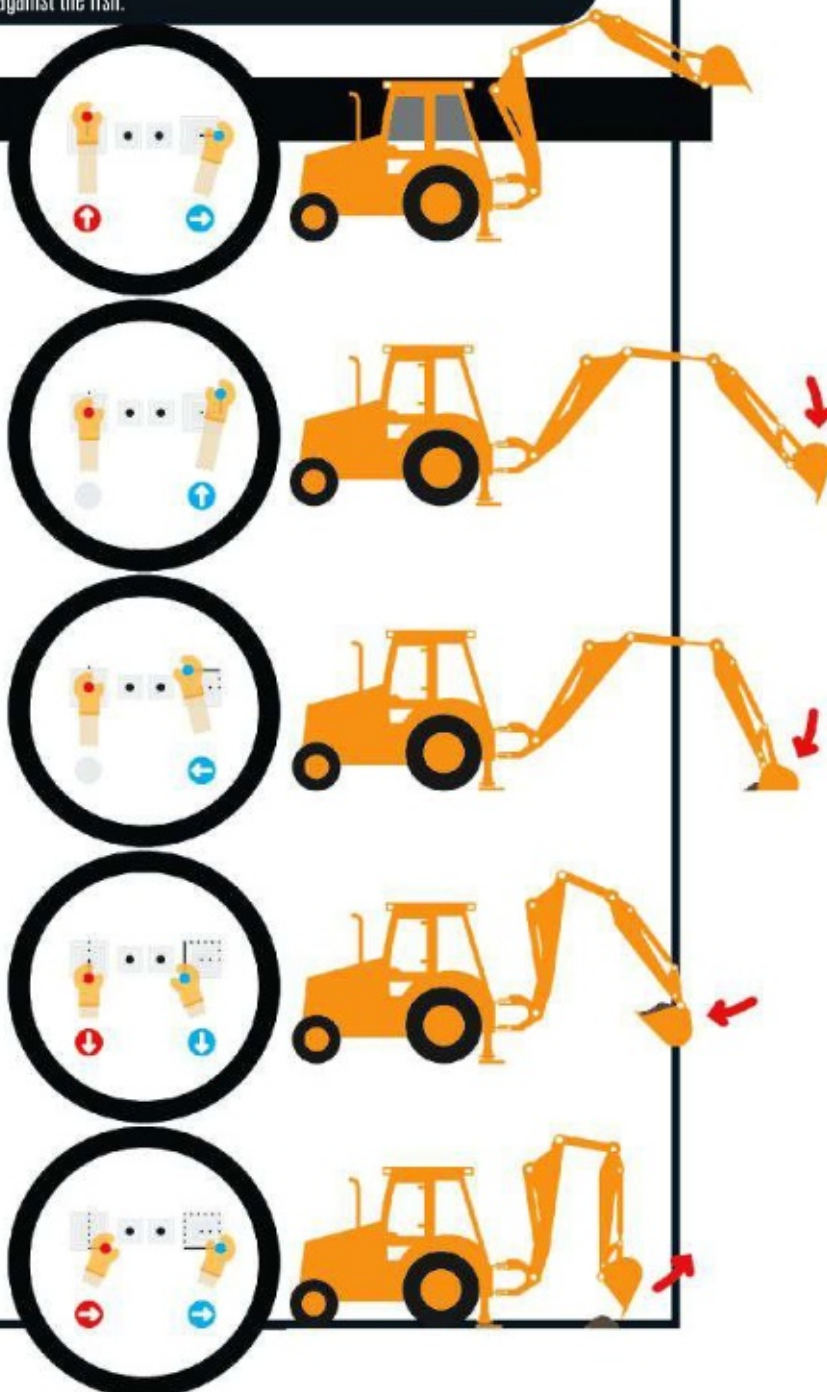
1. Open the bucket "I'm at the point now where I can move the machine like my own body," Nick Market says. "The key is to get a feel for the hydraulics." First, put the stabilisers down to steady the backhoe, and release the boom lock. Push the left control forward to extend the backhoe's stick. Push the right control to the right to open the bucket.

2. Lower the boom "Be aware of what's around you," Market says. "Be especially careful digging around utilities." Push the right control forward to lower the boom.

3. Start to dig Push the right control to the left to curl the bucket inward, lowering it into the ground to scoop up soil. "It's usually a good idea to go in at an angle," Market says.

4. Lift the load Pull the left and right controls back at the same time to retract and raise the boom while keeping the bucket curled. "Don't overfill the bucket," Market says. Most backhoes have a reach of about 4 metres. A device called an extend-a-hoe adds another metre and a half.

5. Dump the dirt Push the left and right controls to the right to open the bucket, pull the stick toward the cab and dump the load. "Don't raise the load up too high," Market says. "There's a major tip factor there." He also operates the machine at full throttle. "It's all about precision, control and speed," he says.



→ SEE POPULARMECHANICS.COM/EXTREME FOR MORE DETAILED INSTRUCTIONS.

HOW TO: EXTREME TOOLS



DEGREE OF
DIFFICULTY



MONOSHOCK RAM

Ballast slides like a piston inside a door-breaching battering ram.

US law enforcement officials grip flexible handles on Blackhawk's 10-cm high-density polyethylene tube. When swung into a locked door, the ram's internal weight slings forward, amplifies force and isolates the impact shock from the user. Have ID ready: sales to civilians are prohibited.



PICKAROON

Chopped timber flies to the woodpile when skewered on the pickaroon tip.

The 90-cm pickaroon punctures log ends to move firewood as fast as a helper can buck it. It looks deadly, but pickaroon.com's Johann Hoche says there's just one big danger: "If you don't stick it good in a log, it could pop out, and you'll go over backward," he says.



UNDERWATER CHAIN SAW

Bellow "Timber" into your snorkel and clear-cut the pond.

Demolishing underwater dock and bridge pilings is easy with Stanley's CS11, an anti-kickback saw for underwater arborists in need of a 140-bar hydraulic motor and over a metre of bar length.



DEGREE OF
DIFFICULTY



STUNT-JUMP A CAR

"With a ramp-to-ramp jump, a centre section or tabletop is in place during test jumps to establish speed and height while not damaging the equipment," says Formula D racing champion and Hollywood stunt driver Rhys Millen. "Then the centre section is removed to expose an impressive height and gap." The ramps can be made in a day. Perfecting the jump distance varies based on the car's suspension, weight and wheelbase and the balance of the car at a certain speed. "With a good stunt co-ordinator and correct set-up, the jump is the easy part."

EXPERT



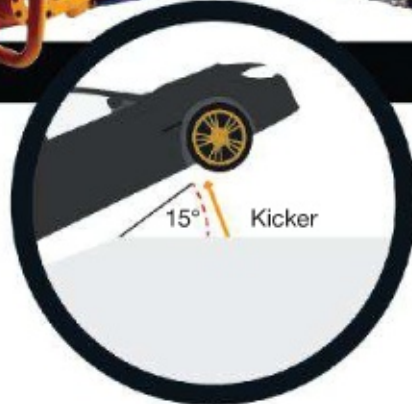
A veteran of *The Dukes of Hazzard* and three *The Fast and the Furious* films, Millen was the first person to successfully back-flip an off-road pick-up.

1



VIDEO

> Check out Rhys Millen's almost perfect back-flip in a pick-up truck on www.popularmechanics.co.za



2



CONCRETE SMASHER

Driveways don't stand a chance against the king of the pavement pulverisers.

• With 900 blows per minute and 270 newtons of impact pressure, the DeWalt pavement breaker earns its keep. One Northern Tool customer testimonial is titled, "What sidewalk?" Another user put it through 30 cm of 40-megapascal concrete. Chuck the 75 mm chisel, clear the area of any flammable liquids, get your boots out of the way and reduce concrete to its powdery aggregate origin.



BOULDER BLASTER

Bomb rocks out back with a dyn-o-mite explosive kit.

• Drill 25-cm-deep holes into a large, bothersome rock. Clear dust from the holes, drop in a pair of Micro-Blaster charges (below), insert firing pins, connect a pneumatic line and detonate from 8 metres. No licence required!



STUMP GRINDER

Stop suffering with unsightly stumps.

• PM contributor Joe Truini once spent an entire day trying to clear a stump with an axe, a spade, a hoe, a pick and a chainsaw. "Ended up with a hole the size of a Buick, and still couldn't get the stump out," he says. Truini had better luck with a Vermeer SC252 stump grinder, a 20-kW machine with a 40-cm-diameter cutting wheel. It bit off 75 mm at a time, sweeping side to side until the stump became a 10 cm crater. It took 90 minutes.



TRUCK WINCH

A 7 000-kg winch bulks up the big pick-ups.

• Straighten a sagging barn, haul a log or tow a Civic out of a ditch – with a winch, it's a cinch. Anchor the pick-up, align the winch for a straight-line pull and stand clear. Re-spool wire rope evenly across the winch drum.



1. Get going Have a long lead-up to avoid unsettling the car before flight. Long-distance jumps can require a high speed of 100 to 150 km/h, but most jumps are made at speeds between 55 and 70 km/h.

• **2. Hit the ramp** An elevated kicker at the ramp's edge lifts the car's nose. It descends into the ramp as the rear wheels pass.



3

3. Fly straight "When you leave the ramp, lift out of the throttle," Millen says. This makes for a more even flight, with no twisting. In a nose-dive, hit the throttle to lift the nose of the car.

• **4. Land that thing** In most cases, the car falls nose first. If the nose tends to drop too much, a 150- to 225-kg weight is added to the boot.



4



KEY TOOL

Bungee seat: Millen rides in a cradle-like seat suspended from the roll cage. Held from straps under tension, the seat saves the driver's back from compression as the car lands.

→ SEE POPULARMECHANICS.COM/EXTREME FOR MORE DETAILED INSTRUCTIONS.

BUILD A PULSE JET

DEGREE OF DIFFICULTY



Bellowing up to 140 decibels, a valveless pulse jet drastically accelerates the speed of bicycles, scooters, skateboards and carousels. "The most common misunderstandings are the engine's fuel flow – lots – and the starting air – a trickle," pulse-jet expert Larry Cottrill says. Here's how he makes one from scratch in 8 hours – "and I don't even have a decent workshop," he says.



Build a chamber

Cut 22-gauge mild sheet steel, tracing a pattern with aircraft snips, to fabricate a two-piece combustion chamber. Using a pipe anvil and mallet, roll a long open cone. Use the mallet to form a blunt dome to cap the cone. Weld each cone's seam. Drill a hole in the dome's tip and weld on a spark-plug mount nut.

Make a tailpipe

Cut and file an exhaust tailpipe and an intake pipe from lengths of thin-walled tubing. Use a ball-peen hammer to flare each end. Fit the narrow end of the chamber cone into the exhaust.

Connect it

Weld the dome and the tailpipe onto each end of the combustion cone. Cut a hole in the cone side for a port to fit the intake pipe.

Mount and fire

Fit the rig on a Bukowsky mount (see glossary). Arrange a propane torch so the flame goes across the tailpipe opening. Light it and blow air in.

GLOSSARY

Bukowsky mount: A simple rack that uses a hose clamp to secure the tailpipe to a rear bracket while the spark plug connects to a front bracket. The mount prevents the engine from moving when ignited, and a built-in heat shield protects the operator.

DEGREE OF DIFFICULTY



MOVE A HOUSE

Cut the utilities

Jay Thompson of Atlantic Structure Movers disconnects water, sewage and electricity lines, then drills through the foundation and slides steel beams under the house.

Jack it up

Thompson pulls a lever on a Jahns Structure Jacking System to send hydraulic fluid into the jacks under the steel beams. Daylight appears beneath the house.

Crib the crib

Jacks raise the house, the crew supports it on cribbing, and then it is jacked up to truck level. "We've moved homes with all the furniture inside," Thompson says.

Truck it away

Thompson slides a flatbed beneath the building, and friction alone holds it in place for the journey. At the new lot, he removes beams and cribbing, then lowers the house to its foundation.

DEGREE OF
DIFFICULTY



CLIMB A GIANT TREE

Tree Trek Exploration founder Wild Bill Maher uses the double-rope technique to climb 60-metre redwoods. Harnessed in a saddle with a sling around a branch, Maher never climbs with spikes – but he does sleep up there.

Find a tree In a five-day class, Maher trains novices for a guided climb.

Rope a branch On a 60-metre tree, the lowest branch is 25 metres off the ground. Sling a weighted bag over it and tie the climbing rope to the throw line.

Saddle up Sit in a climbing saddle. Slip your feet into rope loops. Tie a sliding hitch knot. To climb, pull down on one rope and slide the knot up. At the first branch, tie into the tree. Toss the throw bag to the next branch and go.



TIP



To fine-tune a house's position in a new location, Thompson uses tilted jacks that rest on rolls of foam padding. As the jacks take on weight, they straighten and shift the house into place. "If I get all four jacks tilted in different directions," Thompson says, "I can rotate the house."



DEGREE OF
DIFFICULTY



EXPERT



Dennis McCarthy, a car co-ordinator whose work appears in *The Green Hornet*, has built stunt and race cars for 20 years. "Beware the first-time roll-cage builder," he says.

WELD IN A ROLL CAGE



Prep the interior

Strip the cabin to reveal the mounting points and remove materials prone to catching fire during welding.

Find mounting points

The Sports Car Club of America specifies at least six mounting points (see diagram, left). Weld the roll bar directly to the box frame; in unibody cars, a 230 cm² steel plate 3 mm thick must be used as a footing.

Key step Set the main hoop (above the driver's head) first; the rest of the cage grows from this crucial part.

DEGREE OF
DIFFICULTY



LASSO A BULL

"The actual roping of a horse, bull or 700-kg steer is a matter of seconds – a very intense 10 seconds," says Chase Cervi, a Colorado-based rodeo pick-up man (the guy who rescues riders after a fall). "The closer you can get to the steer or the horse, the better," Cervi says. "Aim for the head. Pull the slack of the rope quickly to secure it around the animal's neck. Keep your upper body square and up over the saddle horn. This puts you in a good position to dally. It all happens fast, and you've got to slide the rope so that you don't choke the animal."

GLOSSARY

Dally: Cowboys connect the lassoed animal to the saddle by wrapping the rope counterclockwise around the saddle's front horn.
Roping saddle: A heavy, sturdy saddle with a thick, large horn used to control a dallied animal. The saddle has a low rear cantle and a slick fork, or seat. Both allow a quick dismount.



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Our responsibility extends beyond only marketing our products. Since 1994 more than ONE BILLION litres of used lubricating oil has been collected and recycled in South Africa. As members of the ROSE Foundation we have been preventing pollution and preserving our most important natural resource - OUR WATER. For more information call the ROSE Foundation on 021 448 7492, email usedoil@iafrica.com or visit www.rosefoundation.org.za



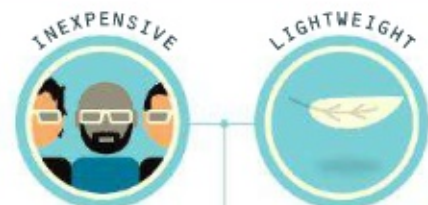
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DIGITAL CLINIC

> BY SETH PORGES

Q+A



of the format, customers have coughed up the extra cash.

But the 3D TV industry has a problem on its hands. The

current technology used to power 3D sets is flawed. Pretty much every 3D TV available up until now has relied on what are called active-shutter glasses – battery-powered spectacles that work by blacking out alternating eyes at a rate of 120 times per second. This is fast enough to deliver different images to each eye without users consciously noticing what is happening. The result is an often-stunning high-definition 3D image, but it comes at a steep price – and I'm not just talking about the several hundred rand the glasses cost. These gizmos require batteries, are heavy enough to cause discomfort (we've got the red marks on our

noses to prove it) and, for some users, can be positively nauseating. As part of a recent 3D TV test, I used the glasses to watch TV for 4 straight hours, and walked away feeling woozy and exhausted. Even the TV-makers I spoke to called me brave for enduring this.

These flaws could enter deal-breaker territory for all but the most adventurous early adopters – which is why I'm so excited about the new breed of 3D TVs that ditch active-shutter glasses.

At the Consumer Electronics Show in January, major manufacturers such as LG and Toshiba announced sets that use the same "passive" 3D glasses found in movie theatres. These glasses are inexpensive enough to let a casual user outfit a party, and they have no batteries or moving parts. And because they don't flicker on and off hundreds of times per second, users are far less likely to walk away with a case of the woozies. Better still, a Toshiba rep told me that, because the new TVs don't require an infrared transmitter to sync up with the glasses, they are actually cheaper to make than active-shutter 3D TVs. Wins all around!

Well, almost all around. This technology

The next wave of 3D TVs

Q I read about new 3D TVs that use the same kind of glasses as a 3D movie theatre. What's the deal with those?

A For the past few years, the electronics industry has been unrestrained in its enthusiasm for 3D TV. Okay, positively giddy is more like it. But who can blame manufacturers for wanting to get in on

the action? After all, their friends over in the movie industry have been using 3D's inflated prices to pad their bottom lines for a couple of years now. And with breakthrough hits like *Avatar* making use

is nothing new – as I said, you’ve probably worn the same glasses at 3D theatres – so one has to wonder why TV manufacturers haven’t built it into more sets before. One major reason: the glasses can’t deliver a true high-definition picture using existing television sets.

With active-shutter glasses, each eye takes turns looking at the screen, and when they do, they see all 1080 lines of high-def crispness. With passive glasses, the pixels are split between both eyes, meaning the resolution is effectively cut in half.

But with any evolving digital technology, no flaw is likely to last forever. RealD (the same company that provides the 3D tech for many movie theatres) has teamed up with Samsung to deliver sets that have it both ways – passive glasses and full high-definition. They’re calling the tech RDZ, and it works by rapidly switching the TV’s screen between full-resolution left- and right-eye images. This is similar to how active-shutter glasses work, but because the left and right images are circularly

polarised in opposite directions, they can be directed to different lenses on the polarised passive glasses. At press time, Samsung had yet to announce pricing or availability for the new TVs, but we expect them to appear sometime this year. Of course, not even these new sets will fix the other problem facing 3D TV: a scarcity of content.

ZOOM STUCK

I don’t know what I did on my laptop, but I somehow caused my screen to zoom in, and I have no idea how to zoom it back out. Help!

Oh, screen zoom. You’re great for getting a close look at pictures and text, but if accidentally activated by an unaware user, you can be a nightmare – and that goes for both Mac and PC users. Macheads can undo the damage by holding down the Control button, then using fingers to swipe from the top of the trackpad to the bottom. To rezoom, simply swipe upward. If

tech
tip

Want to send a link to a particular part of a YouTube video? Add “#t=”, followed by the target time, to the end of the URL. So if you want the link to zoom clickers to 1 minute and 23 seconds into the video, finish off the URL with “#t=1m23s”.

you’re worried about getting stuck in zoomed-in purgatory, you can disable this feature – go to System Preferences, click Trackpad, and then uncheck the Screen Zoom box.

Windows calls the feature Magnifier, and it can be found in the Ease of Access settings in the Control Panel. If you’ve turned it on by mistake, look for a magnifying-glass icon in the upper left corner of the screen. Click it and follow the dialogue box’s instructions to exit the mode. Then go to the Ease of Access settings and deselect Turn On Magnifier. **PM**

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WIN one of 8 Dremel Multi-Max tool sets valued at R2 250 each

With the new Multi-Max, Dremel brings a superior consumer experience to the cordless oscillating tool category. It’s the ideal tool for anybody who wants to repair, restore or remodel. A quick-change accessory system allows a fast change of accessory to suit any situation, while the two batteries ensure enough endurance to handle any hobby or home project. Cut and sand wood, metal, plastic or drywall, grind cement and mortar and remove grout – all with one tool.

To enter, answer the following question:

How many batteries is the Dremel Multi-Max equipped with?

SMS: Dremel, followed by the answer, your name and e-mail address to 34419 (R2 per SMS) or visit our Web site at www.popularmechanics.co.za; competition closes 31 May 2011.

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PM DRIVE

BRIO IN THE DNA **ALFA ROMEO GIULIETTA**

A winding mountain road, light traffic, an Italian thoroughbred... could life be better? Hmm... my greying, 1,8-metre passenger wasn't exactly the stuff of romantic fantasy, but then again he could have said the same about his balding, 50 something companion.

Still, we both took care to approach the Giulietta with due reverence. Created half a century ago to bring Alfa to a wider audience, it's a name resonant with tradition.

Part of the greater Fiat family and based on the company's new Compact platform, the Giulietta is inevitably less of an individualist than its forebears. For one thing, it's a 5-door hatchback. However, the designers have leveraged the corporate underpinnings for optimum technology effectiveness while managing to retain that innate sense of style that has characterised the marque's more notable products (and there have been a couple of

iffy ones). One notable consequence of this has been that the Giulietta achieved the highest Euro NCAP safety score ever (87 out of 100) by a compact car. In addition, the new platform was devised to guarantee the utmost interaction of the systems in charge of controlling the vehicle dynamics.

Like other new Alfas, the Giulietta can match its mood to the driver's via its DNA (Dynamic, Normal and All Weather) modes. Yet, it is





pitched as a sports sedan, combining dynamics with a high degree of comfort and refinement.

At launch, only the 1.4-litre turbocharged versions were provided for driving. With 88 kW from the 1.4TB and 125 kW from the 1.4TB MultiAir, that wasn't as much a hardship as you'd think, but predictably the mutters during refreshment breaks turned to the prospect of the Quadrifoglio 173 kW 1750 with direct injection. (Alfa says that the 1750's specific power of 99,92 kW per litre is the highest ever achieved by one of its production engines, and the specific torque of 195 N.m/litre, is the highest of all petrol engines in this category.)

Given the modest power output of the lesser models, performance is steady rather than sensational. Our test route in the Boland, out and back over Franschhoek Pass to the interior, showed off the engine's eager revvability, the chassis' secure feel in tight corners, and the overall package's superb ride quality. Still, like most modern cars the Giulietta also allows drivers to indulge their Green leanings via such technology as Start&Stop. Fiat says the 125 kW MultiAir engine has fuel consumption and emission levels resembling a diesel engine's: 4,6 litres/100 km on the extra-urban cycle, and CO₂ emissions of 134 g/km.

A manual 6-speed gearbox is standard. During the second half of 2011, an innovative dual-clutch automatic transmission will be introduced.

Price: from R243 000, which includes a 5-year/150 000 km warranty, 6-year service plan, and 24/7 AA Fleetcare roadside assistance for three years.

TECH HIGHLIGHT:

Conventional automotive sat-nav involves all sorts of dedicated hardware from video displays to onboard hard drives. The Giulietta's solution: a novel combo system that integrates TomTom portable navigation with Alfa's Blue&Me interface using Bluetooth. The TomTom unit sits on the dashboard using a support that, says Alfa, is designed to guarantee maximum safety in the event of impact and complete integration with the vehicle's other systems. When you leave the car, you can simply pop it out and take it with you if you like. Why doesn't everybody do it this way?

TAKE THAT! CITROËN C4

Here's a car that – based on first impressions, anyway – can quite comfortably stand toe to toe with the competition from the likes of VW, GM and Toyota, except for one detail: its badge. Rightly or wrongly, in the minds of local motorists,

Citroën is associated less with avant-garde design and high-tech than with high running costs and low resale value. Last year when Citroën France took over the brand in South Africa from the local importers, the French newcomers realised that they had a battle on their hands to restore the name.

So far, restorative action has included aggressive parts pricing and a fixed-cost service deal on certain models. I'd go so far as to say that the C4 is another massive step in the right direction.

Exciting, it ain't (at least in the 1.6-litre version we drove at the local launch). But it feels well screwed together, it is very well equipped, and rides comfortably over poor roads. And, albeit that looks are a personal thing, the conservative styling of the new C4 should wear well, unlike some of the bizarre attempts of previous models.

Yet the C4 is hardly boring. Its roomy, neat interior has a quality feel, and dynamically the superb ride comfort is matched by secure handling and precise variable electric power-assisted steering. The drivetrain lacks zip at altitude – we needed to make enthusiastic use of the smooth-shifting 5-speed manual 'box – but after all the VTi 120 does only have an unpretentious 88 kW Four. There's much more available in the THP 155 model, which uses a turbocharged version of this engine, developing 115 kW and mated to a 6-speed clutchless transmission. (A 4-speed auto is offered on the VTi.) Performance as a whole is better compared with the previous model because Citroën have shaved 80 kg off overall weight. CO₂ emissions vary between 143 g/km and 159g/km depending on the model; a gearshift indicator in the instrument cluster is standard.

Luxurious touches not usually seen in this bracket include an electric lumbar massage facility on the front seats. Connectivity and multimedia features include USB and Bluetooth, and optional eMyWay navigation with a high-resolution colour display and an internal memory.

And, of course, Citroën has formidable safety credentials: the C4's 5-star Euro NCAP rating apart (a total of 6 airbags), standard equipment includes traction and stability control, electronic brake force distribution and emergency braking assistance. The "intelligent" speed limiter/cruise control features up to 5 memory settings, and the front fog lamps switch on automatically during cornering to light up areas to the side of the vehicle. A blind spot monitoring system is optional.

Prices: from R203 900 to R265 900, which includes a 5-year or 100 000 km service plan.



PM DRIVE

SNAPPY SHIFTER TOYOTA VERSO CVT

Could we be seeing the swansong of manual transmissions in everyday use? Toyota certainly appears to be convinced that continuously variable transmission is the way of the future: the new Verso gets a CVT – and we are told more of them are on the way.

The switch to CVT mirrors the trend towards automatic transmissions for cars regularly used in the commute, Toyota says. “You can expect to see CVT on a lot more of our vehicles going forward,” one official noted. Currently, CVT is being offered only on the petrol-engined Verso 1.8 SX.

We took our Verso on the Southern Cape’s road less travelled: the old George-Knysna route. As well as being scenic, this mostly gravel road is badly rutted and pot-holed, but the Verso took it all in its stride. The gearshift – sorry, speed ratio shift (see below) – is surprisingly crisp and the powertrain, pushed hard, is very eager and responsive. Sequential shifting is accomplished by either the console-mounted lever or paddles located behind the steering wheel. There’s a Sport mode that, in a vehicle like this, could generally be regarded as redundant. However, one plus when using Sport is that because of the relatively lower “speed ratio” selected in this mode,

engine braking is better, enhancing towing.

You wouldn’t expect top-drawer dynamics from a vehicle like the Verso, so the rather numb steering doesn’t surprise, but on the upside it is precise.

The introduction of the CVT coincides with a facelift to the entire range. Updates range from privacy glass in the rear half of the vehicle to new headlight designs; parking sensors on upscale models; an audio/auxiliary jack that synchs the car’s audio system with players such as iPods; and a plethora of new storage spaces.

There’s a choice of either a 97 kW 1.6-litre engine with 6-speed manual transmission or 108 kW 1.8-litre in petrol form, or a turbocharged 93 kW 2.0-litre diesel that develops 310 N.m. Prices start at R244 400.

How it works: A belt drive between two pulleys offers, in theory, seamless and infinitely

varying gear ratios. In practice, there are 7 preset steps – Toyota prefers “speed ratios” – with manual sequential shifting in Shiftmatic mode.

Unlike previous CVTs, this chain-based design doesn’t use a rubber belt with metal inserts. About 30 kg lighter than a conventional automatic gearbox, the CVT hints at better acceleration than previous-generation CVTs as well as improved fuel consumption compared with traditional automatic gearboxes. Like its predecessors, this new-generation design factors engine power and driver input into its gearshift scenario. But to that it now adds engine and vehicle load and driving conditions.

Tech features of the new CVT include a smaller torque converter and an uphill/downhill gearshift control that smooths upshifts on uphill while optimising downshifts on downhill for improved engine braking. Low-speed

PM DRIVE



lock-up, previously set at a 60 km/h threshold, now comes in as low as 20 km/h, benefiting economy.

According to Toyota, the CVT compares favourably with the conventional automatic box in regard to service life and maintenance. Should the CVT suffer a failure, the engine management system will engage a “limp home” mode that cuts torque output.

SLICK SEDAN 2011 CHRYSLER 300

With a choice of a modern, flexible V6 or a famously brawny V8, Chrysler’s new 300 seeks to pick up where its award-winning forebear left off. Now flaunting crisp creases in its cubist shape, and modelling an upscale grille between jewelled headlights, the 300 has the look of an athlete in a sharp suit rather than that of a nightclub bouncer. Chrysler has quieted the cabin and refined the suspension action to great effect. The company has also beefed up the structure, added the latest driver aids (such as collision warning, blind-spot monitoring and an AWD option) and slathered the interior with upscale materials and textures. It’s now a car that feels like it belongs in the premium class, yet prices are pitched well in the ballpark of the mid-sized competition. – Barry Winfield



HEAD FOR THE HILLS **JEEP GRAND CHEROKEE**

With the Grand Cherokee, there's little doubt about what you're getting: oodles of luxury, a brawny big-capacity engine, and supreme off-road ability. So it was disappointing to be told that the route for our off-road test drive would be more scenic than spine-chilling.

Fortunately, the route description was more than a little off. We wove our way from lowveld savanna up and around clefts in the mountains, on surfaces that ranged from tricky to treacherous, until we summited, high up on an escarpment overlooking our starting point. Without breaking a sweat. That was more like it. The Grand Cherokee has not lost its mojo; on the contrary, it's got even better.

For 2011, the Grand Cherokee has taken its proven recipe and added a few more party tricks. Combine Quadra-Lift air suspension and Selec-Terrain traction control with new front and rear independent suspension and off-roading becomes as near to a no-brainer as humanly possible. Quadra-Lift varies ride height from a low of 104 mm, for parking, to a massive 270 mm. Understandably, the approach, departure and breakover angles are much better than before.

There are two basic 4x4 layouts: Quadra-Trac II and Quadra-Drive II with rear Electronic Limited-slip Differential (ELSD). To optimise drive automatically according to the prevailing conditions, the Selec-Terrain system provides five settings for specific terrain, electronically co-ordinating up to 12 different areas of powertrain, braking and suspension operation.

The Grand Cherokee's profile is altered little from its most recent iteration, but viewed from the front three-

PM DRIVE

quarters a distinctly macho appearance is evident in the sleeker wheelarch "eyebrows" and distinct scalloping on the sides. Besides looking good, it's improved the aerodynamic drag factor from 0,404 to 0,37.

A quibble about previous Jeeps was that they could be cramped – both seating accommodation and access. That's been attended to by increasing door opening front and rear significantly, and by stretching rear knee and leg room. All that's been done without compromising on cargo volume, which is a whopping 19 per cent bigger than before, at 994 dm³.

As Jeep's flagship, the Grand Cherokee doesn't stint on high-tech safety and security features; suffice it to say that you won't be asking, "But what about...?" For the record, highlights include Electronic Stability Control (ESC) with Electronic Roll Mitigation, Hill-start Assist, Trailer-sway Control and Hill-descent Control; Adaptive Cruise Control able to sense and act on vehicles in potentially hazardous positions; Forward Collision Warning (FCW) system to detect when you appear to be approaching another vehicle too rapidly; and Uconnect, which incorporates sat-nav and telephone syncing.

Two engines are available: the new 3,6-litre Pentastar V6 engine delivers 210 kW and 347 N.m with economy up to 11 per cent better than the previous V6 Grand Cherokee, and the 5,7-litre V8 delivers 259 kW and 520 N.m. To aid economy, the V8 seamlessly switches to four-cylinder operation when all eight cylinders are not needed. A diesel is expected later this year. Prices start at R531 990 for the 3,6 Ltd, reaching R637 990 for the V8.



HE AIN'T HEAVY, HE'S MY CROSSOVER SSANGYONG KORANDO

It's been five years since we last saw a new SsangYong Korando – and how things have changed. The quirky, looks, short wheelbase, beefy demeanour have morphed into something more compact, less 4x4 and more crossover. Overall, it is much more carlike than its predecessor.

Penned by Italian design maestro Giugiaro, the new Korando is SsangYong's first monocoque, and to bear out its crossover credentials its suspension consists of McPherson struts up front and multi-link layout at the rear. At launch, only a 2wd model is available.

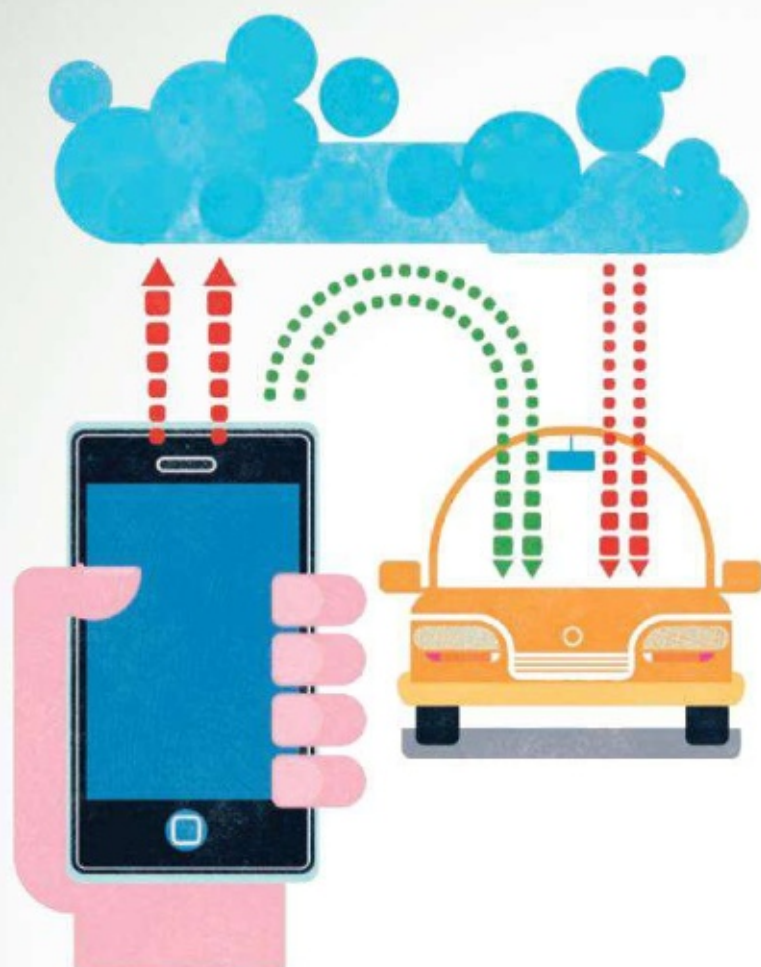
The 2-litre diesel with is mated to a 6-speed transmission. It develops 130 kW and 360 N.m, gets 6,1 litres/100 km on the combined cycle and measures 159 g/km of CO₂ at the tailpipe.

The high-tech new engine, badged e-XDi200, features E-VGT (Electric Variable Geometry Turbocharger) upstream of its third-generation 1 800-bar common rail fuel injection. In the combustion chamber, SsangYong says the air/fuel mix swirl level has been made flexible for different gear ratios to achieve the cleanest possible diesel combustion. Further aiding clean combustion are exhaust gas recirculation and a catalysed diesel particulate filter. An advanced balancing system, optimised chain drive layout and uprated insulation methods have been combined to reduce noise and vibration, particularly at medium to high revs.

Safety features include twin airbags and active head restraints up front, plus ABS brakes with an emergency brakeforce system.

Price: R294 995, including a 5 year/105 000km service plan with roadside assistance.





APPS HIT THE ROAD

CAR ELECTRONICS EVOLVE QUICKER THAN NEW VEHICLES CAN BE ENGINEERED, SO MANUFACTURERS ARE TURNING TO APPS TO CONTINUALLY ADD NEW FEATURES.

By Larry Webster

In-vehicle entertainment and information systems – collectively known as infotainment – are quickly becoming as important to buyers as what's under the bonnet. Last year in the USA, 4 out of every 5 Fords sold had some version of Sync, and other manufacturers are rushing to meet the demand. But there's a problem: when it comes to gadgets, we're conditioned to expect hyper-evolution, not the years it takes to engineer a new car. So manufacturers are now turning to app-based platforms – much like the ones on smartphones – to provide a continual feed of new features. Carmakers, however, are reluctant to open the doors to an uncharted flood of third-party developers.

"We want to retain the customer experience we've worked to establish," says Stephan Durach, the director of BMW's Palo Alto research lab. That means the apps, which either live on a smartphone, in the car or in the cloud, will use the interface already in the car's dash. Or, as in the case of Ford's AppLink, voice commands, which will be a required feature to minimise driver distraction. That's an issue that will remain hot.

In any case, we're in the early stage, and the available apps are already-familiar ones such as Pandora and Twitter. That could change quickly. Ford says it is currently reviewing 1 000 third-party submissions. GM recently announced a contest for university students to submit ideas that may one day lead to unforeseen capabilities. In the meantime, here's a sampling of what's coming or is already here.

Illustration by Christian Montenegro



MINI CONNECTED > Car-specific apps live on an iPhone but are displayed on the car's screen and controlled by the dash knobs. The currently available apps (Pandora, Twitter, Web radio, a driving-efficiency coach and others) are available for free in Apple's iTunes Store. Will soon work with non-Apple phones.

Best Feature > The Twitter app reads the car's internal data and offers canned status updates such as "Heading to Chicago. It's 22 degrees, the top is down and life is great!"

Availability > Currently on Minis equipped with the navigation system, and will soon join BMW's line-up.



TOYOTA ENTUNE > With Entune, your Bluetooth-enabled phone is a gateway to car-specific apps that live in the cloud. The apps are displayed on the navigation screen and offer some voice-controlled features such as Bing search. Presently, apps include OpenTable and Pandora, but will expand. One downside: The service will eventually come with a not-yet-specified fee.

Best Feature > The Pandora mobile app uses the same familiar screen and functions as it does on your computer.

Availability > Coming this summer in the Prius v (a wagon version of the Prius) and in more cars later this year.



FORD APPLINK > In conjunction with Ford's Sync system, the apps live on a variety of phones and connect to the car with either Bluetooth or a USB cable. Bonus: AppLink does not require the car to have a pricey factory navigation system, and Ford's already relying heavily on voice commands.

Best Feature > For Pandora, say "thumbs up" when you like a song.

Availability > In the Ford Fiesta with the optional Sync, and in the Ford Mustang later this year.

QUICK CHARGER 2012 FORD FOCUS EV

Ford's electrified Focus swaps the petrol engine for a 92-kW electric motor and carries a liquid-cooled 23-kWh Li-Ion battery pack under the floor and rear seats. The range should be

about 150 km. In other words, it will perform a lot like Nissan's Leaf. Ford, however, claims the Focus can be recharged in only 3 hours. Granted, that figure assumes a 240-volt Level 2 charger,

but even with the higher voltage, the Leaf requires about double that time. If that claim is true, the Focus EV will be a huge step toward making EVs more usable. – Ben Wojdyla



SILENT DELIVERY FORD TRANSIT CONNECT EV

Ford's first credible EV, an electrified version of the Transit Connect van, is on sale in the US now, although only about 200 will be produced this year. Thanks to an under-the-floor lithium-ion battery pack (28 kWh), the cargo hauler doesn't lose any interior space, but the extra half-ton of weight reduces payload to about 500 kg. The electric motor's paltry 58-kW maximum output is offset by near-instantaneous torque (158 N.m), so it doesn't feel slug-bug slow. While it's meant mainly for utility-company fleets, eco-minded suburbanites can buy a TC EV with rear seats. But they'll have to endure a steep (the equivalent of about R400 000, before incentives). – Ben Wojdyla PM

invent
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(Image adapted from electrostatic precipitator made by Geecon (Pty) Ltd)

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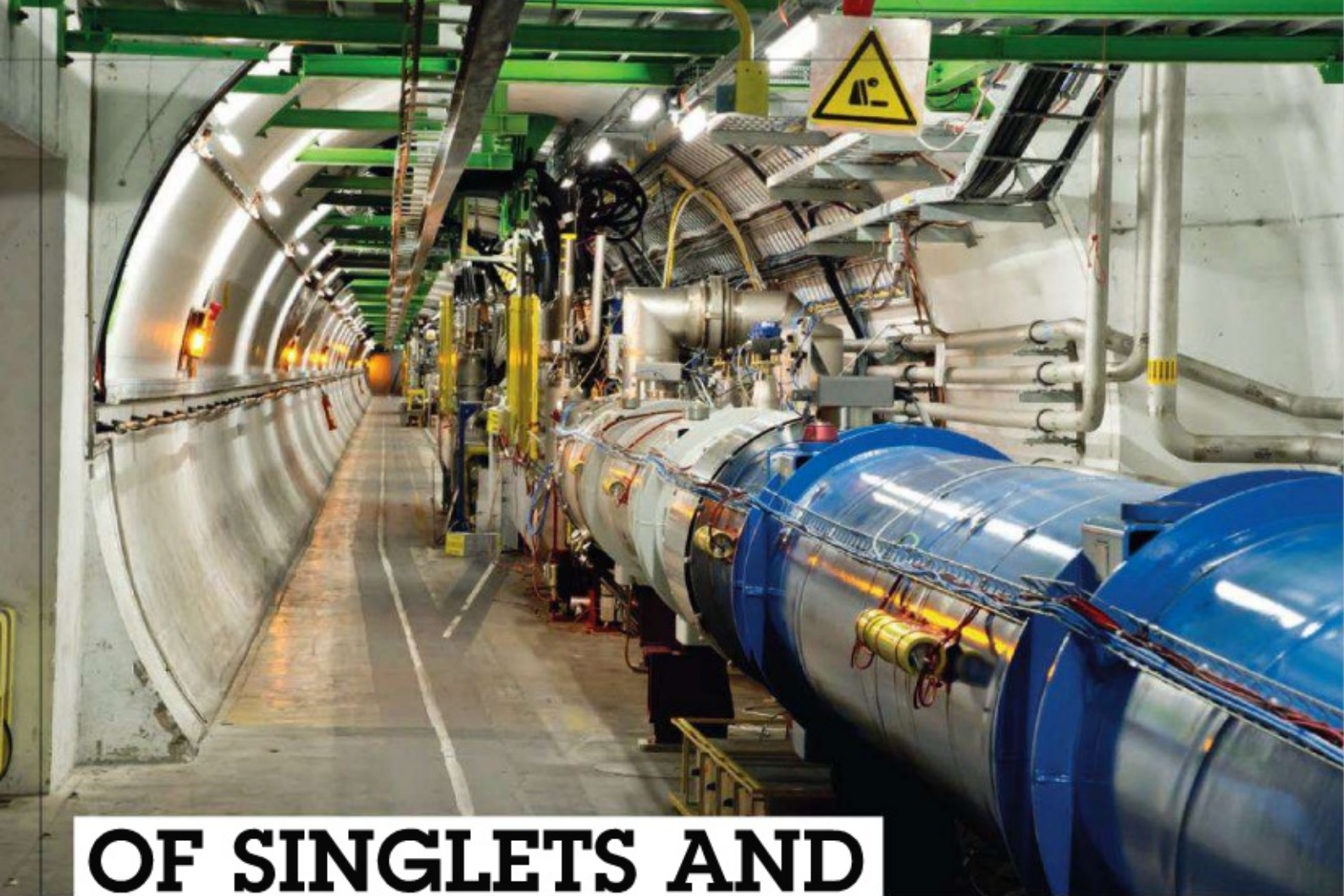
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CERN

OF SINGLETs AND *TIME'S ARROW*

Although it had a rocky start, and faces a short 'technical stop' at the end of the year, CERN's formidably expensive Large Hadron Collider is producing useful data on the subatomic realm. Now for the sci-fi stuff: could this be the world's first time machine? > BY DAVID SALISBURY

IF THE LATEST THEORY of Tom Weiler and Chui Man Ho is right, the Large Hadron Collider – the atom smasher on the Franco-Swiss border that started regular operation last year after some embarrassing teething troubles – could be the first machine capable of causing matter to travel backwards in time.

"Our theory is a long shot," admits Weiler, a physics professor at Vanderbilt University in the US, "but it doesn't violate any laws of physics or experimental constraints."

One of the major goals of the collider is to find the elusive Higgs boson – the particle that physicists invoke to explain

why particles such as protons, neutrons and electrons have mass. If the collider succeeds in producing the Higgs boson, some scientists predict that it will create a second particle, called the Higgs singlet, at the same time. According to Weiler and Ho's theory, these singlets should have the ability to jump into an extra, fifth dimension where they can move either forwards or backwards in time and reappear in the future or past.

"One of the attractive things about this approach to time travel is that it avoids all the big paradoxes," Weiler says. "Because time travel is limited to these special particles, it is not possible

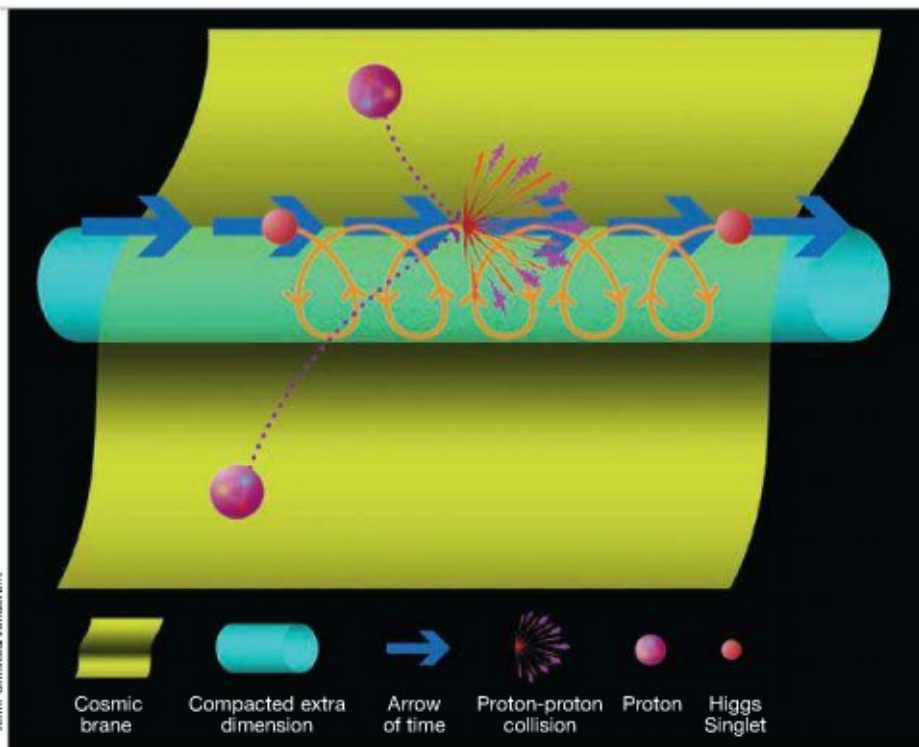
for a man to travel back in time and murder one of his parents before he himself is born, for example. However, if scientists could control the production of Higgs singlets, they might be able to send messages to the past or future."

UNSTICKING THE 'BRANE'

The test of the researchers' theory will be whether the physicists monitoring the collider begin seeing Higgs singlet particles and their decay products appearing spontaneously. If they do, Weiler and Ho believe that they will have been produced by particles that travel back in time to appear before the collisions that produced them.

Weiler and Ho's theory is based on M-theory, a "theory of everything". A small cadre of theoretical physicists has developed M-theory to the point where it can accommodate the properties of all the known subatomic particles and forces, including gravity, but requires 10 or 11 dimensions instead of our familiar four. This has led to the suggestion that our

Jenni Olinstad/Vanderbilt



Left: A section of the Large Hadron Collider, the world's most powerful particle accelerator, located on the border of France and Switzerland (CERN). **Above:** Illustration of singlet time travel theory. When a pair of protons collide in the Large Hadron Collider, the resultant explosion may create a special type of particle, called a Higgs singlet, that is capable of travelling forwards and backwards in time. It would do so by leaving familiar three-dimensional space to travel in an extra dimension. **Top right:** Professor Thomas Weiler, right, and graduate fellow Chui Man Ho.

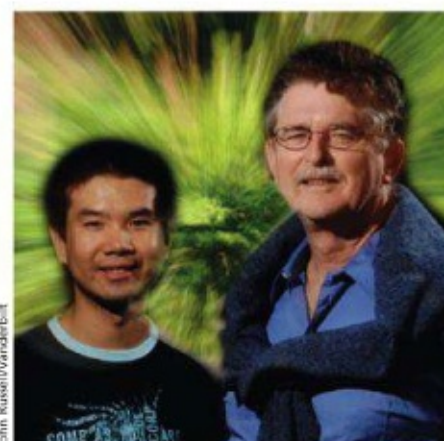
Universe may be like a four-dimensional membrane or "brane" floating in a multi-dimensional space-time known to physicists as the "bulk".

According to this view, the basic building blocks of our Universe are permanently stuck to the brane and so cannot travel in other dimensions. There are some exceptions, however. Some argue that gravity, for example, is weaker than other fundamental forces because it diffuses into other dimensions. Another

possible exception is the proposed Higgs singlet, which responds to gravity but not to any of the other basic forces.

ANSWERS IN NEUTRINOS?

Weiler began looking at time travel six years ago to explain anomalies that had been observed in several experiments with neutrinos. Neutrinos are nicknamed "ghost particles" because they react so rarely with ordinary matter: trillions of neutrinos hit our bodies every second,



John Russell/Vanderbilt

yet we don't notice them because they zip through without affecting us.

Weiler and colleagues Heinrich Päs and Sandip Pakvasa at the University of Hawaii came up with an explanation of the anomalies based on the existence of a hypothetical particle called the sterile neutrino. In theory, sterile neutrinos are even less detectable than regular neutrinos because they interact only with gravitational force. As a result, sterile neutrinos are another particle that is not attached to the brane and so should be capable of travelling through extra dimensions.

Weiler, Päs and Pakvasa proposed that sterile neutrinos travel faster than light by taking shortcuts through extra dimensions. According to Einstein's general theory of relativity, there are certain conditions where travelling faster than the speed of light is equivalent to travelling backwards in time. This led the physicists into the speculative realm of time travel.

IDEAS IMPACT SCIENCE FICTION

In 2007, the researchers, along with Vanderbilt graduate fellow James Dent, posted a paper titled *Neutrino time travel* that generated a considerable buzz. Their ideas found their way into two science fiction novels. *Final Theory* by Mark Alpert, described in the *New York Times* as a "physics-based version of *The Da Vinci Code*", is based on the researchers' idea of neutrinos taking shortcuts in extra dimensions. Joe Haldeman's novel, *The Accidental Time Machine*, is about a time-travelling MIT graduate student and includes an author's note that describes the novel's relationship to the type of time travel described by Dent, Päs, Pakvasa and Weiler.

The really good news, of course, is that the Large Hadron Collider has not – as some sages predicted – created a new black hole in the middle of Europe and destroyed our planet.

PM

Source: Vanderbilt University.



The

UNDERCOVER INVESTIGATIONS HAVE MOVED ONLINE IN THE CAT-AND-MOUSE GAME BETWEEN POLICE AND CRIMINALS.

> BY CAREN CHESLER

About three times a week, Susan James, a 37-year-old blonde prosecutor from the American Midwest, signs on to Facebook as Nakesha*, an attractive 26-year old with a dark ponytail and sunglasses that conceal her eyes.

James created Nakesha's profile from a photo she found through Google. Her favourite TV shows? *Keeping Up With the Kardashians* and *For the Love of Ray J*. Her favourite quote? "What doesn't kill me makes me stronger." She even has a fake birthday, on which her Facebook friends sent her greetings such as, "Yo, happy birthday, mama".

When Nakesha is online, James is undercover. She structured the profile as bait for local criminals, whom she chats up to get a glimpse into their operations. Nakesha now counts drug dealers, gang members and their girlfriends among her 76 friends. "Nakesha has more friends than I do on my own account," James says.

But both women are primarily interested in one man – a drug kingpin James has been investigating for several years.

Illustration by Alexander Wells



Antisocial Network

He's been arrested more than a dozen times but has never gone to jail – in part because he's careful. He changes cell-phones, SIM cards and cars as often as most people change their socks.

On one occasion, James used her Facebook presence to help facilitate wiretapping a phone registered to one of the kingpin's associates. Drug dealers often register phones to bogus names such as Mickey Mouse. But when James, through Facebook, asked the associate what his plans were one night, he responded through an app he had downloaded to his iPhone. Her office quickly tracked the purchase to identify the number.

Like almost every other aspect of modern life, street crime is now deeply intertwined with digital technology. And social networks in particular have become part of the organising structure of criminal networks – from street gangs to anarchist agitators.

To infiltrate these networks, law enforcement officials in both small police departments and large government agencies across the US spend an increasing amount of time looking for criminals on social media web sites such as Facebook, Myspace and Twitter. While they used to go undercover on the street, cops now gather intel online, mining suspects' profiles for photos, accomplices and potential evidence.

"Criminals leave footprints everywhere they go – on their cellphones, on their Twitter accounts and on Facebook," says Lauri Stevens, a principal strategist at LAW5 Communications, a firm that consults with law enforcement on social media strategies. "With advances in geolocation technology, detectives don't just know what the criminal did, but where they did it. Social

media can give them a solid and reliable way of piecing things together."

Many police departments first made the move online in child-predator investigations, in which a detective might pose as a child to snag a paedophile. But the techniques are now used in all areas of law enforcement.

"There was a time when if you handed a cop a laptop, he'd want to throw it out the window," says Boca Raton police chief Dan Alexander. Now, most officers won't part with their iPhones, he says.

Gang-busting

Social media has proved to be irresistible to gang members, says Bruce Ferrell, president of the National Alliance of Gang Investigators' Associations in the US. Gangs use the medium to co-ordinate crimes and recruit new members, but they also like to

show off, posting photos of hand signs, colours, weapons, drugs and cars, all of which can identify an individual as a gang member.

These digital clues have led to numerous busts. Last year, federal authorities arrested six members of East Side Riva, a Riverside, California, street gang, after finding communications the group had sent over Myspace and rap videos it had posted on YouTube to intimidate enemies.

In 2008, a multi-agency task force arrested a Miami gang leader known as Bird Road Rudy after he posted a YouTube video of himself and his friends waving guns in the air and taunting Miami police. The courts sentenced him to six and a half years in jail on federal weapons charges.

Why are gangbangers so eager to incriminate themselves? Mike Bostic, a retired Los Angeles Police Depart-

ment assistant chief, chalks it up less to stupidity than to audacity. "The nature of gangs and criminals is that they can't wait to brag about what they're doing," he says. "They start posting on Twitter and Facebook, and all we have to do is sign up like everyone else and get into the system. Soon, we know what they're up to."

Police can also use evidence discovered on social networking sites as leverage during interrogations, says Jon Shane, a retired Newark, New Jersey, police captain who now teaches at John Jay College of Criminal Justice. Investigators can print out a photo from a suspect's Facebook page showing him at a party at which a murder occurred, and pocket it for when the suspect is brought in for questioning. "When he denies having been at the party, I know he's lying. I already have the evidence in hand," Shane says.

But social media evidence can also be used to exonerate suspects. Dennis Cleary, a criminal defence attorney in New Jersey, represented a woman accused of attempted murder. When the victim testified about her injuries, Cleary was able to contest her story because he found evidence to the contrary on her public Facebook page.

"She said she couldn't go to the gym any more, she couldn't run any more," Cleary says. "But she would post from the gym, on her cellphone, that she was on the treadmill."

Tracking bad behaviour

For months, about 20 officers in the Toronto police department have been hunting for rioters who disrupted the G-20 summit there last June. Violence erupted after a group

The digital arms race

COPS

- Law enforcement agencies routinely tap into location data from wireless phones during investigations.
- Many police cars have cameras that automatically scan and check the licence plates of passing vehicles against databases of wanted criminals.
- A smartphone app called One Force Tracker helps tactical police teams by enabling officers to track one another's positions.
- A technology called ShotSpotter uses microphone arrays to allow police to triangulate the location of the shooter in gunshot situations.

CRIMINALS

- Drug dealers and gang members use prepaid "burner" phones, then dispose of them before cops can set up a wiretap. These phones have even been found inside prisons.
- Thieves steal information from credit cards' magnetic strips with portable "skimmers" or via readers installed over legitimate ATMs.
- Organised cyber-crime networks cover their tracks with anti-forensic software such as Evidence Eliminator and Transmogrify.
- Car thieves use GPS jammers to prevent systems such as OnStar from reporting a stolen vehicle's location to police.

of anarchists broke from a peaceful march and torched police cars, smashed storefronts and looted shops.

Anarchists routinely target G-20 summits, and one of the most potent weapons these groups use to sow chaos is the social-messaging site Twitter. (At the September 2009 G-20 summit in Pittsburgh, anarchist organiser Elliot Madison stationed himself in a hotel room with a view of the street, then tweeted directions to protesters to help them evade police.)

The Toronto investigators had monitored the Twitter feeds of some known anarchists before the conference. Now, says Toronto police detective Mike Jander, the police are friending suspects on Facebook, some of whom used photos of themselves kicking in the headlights of police cars as their profile photos. Thirty people have been arrested to date.

Jander says that for Toronto police, this case is personal. More than 1 100 people were arrested during the mayhem that weekend – most of whom were let go – and police faced a barrage of criticism and cries of excessive force. Some working the case have become almost obsessed with finding the vandals, as a matter of honour.

"When you go home, you can't stop," Jander says. "You're on Facebook or Twitter, because you have to see what so-and-so is talking about today. And then a new YouTube video comes out, and you go frame by frame to see who's in the background."

Because of their ability to reach a mass audience instantly, social posting sites enable instigators to assemble flash mobs that can quickly turn violent. Last year, hundreds of teenagers gathered in Philadelphia's City Hall area

and began terrorising pedestrians and employees of area stores and restaurants after they'd received messages about the meeting on Twitter and Facebook. "We're constantly monitoring them now," said Lt Frank Vanore, a spokesman for the Philadelphia Police Department.

They're not alone. Many departments are now monitoring Twitter and other social media for patterns in the chatter so they can predict crime – and hopefully

ter". It took police there 45 minutes to locate an office computer on which YouTube hadn't been blocked. Once they did, they found the video and the name of the detective handling the case. Days later, police arrested the second suspect.

The party line

Even the Internal Revenue Service monitors social media. In response to a Freedom of Information Act request by the Electronic Frontier

'Some civil liberties experts wonder whether police are going too far, entering areas for which they might otherwise need a search warrant.'

Foundation, America's Internal Revenue Service (analogous to our own SARS) sent the group a 38-page training manual in which it outlines "Internet tools and searches that will be useful in locating taxpayers and determining their online business activity".

Some civil liberties experts wonder whether police are going too far, entering areas for which they might otherwise need a search warrant. Do privacy rights extend to postings on a Facebook page? The answer, according to legal experts, is not really. "It's the same as when police go undercover," says Thomas Nolan, an associate professor of criminal justice at Boston University. "This is stuff in the public domain. It's open to public scrutiny. It's a solid, viable means of attaining investigative leads."

Jennifer Lynch, a staff attorney with the Electronic Frontier Foundation, says people

should have a reasonable expectation of privacy in their personal communications. But, she adds, "if a person accepts a friend request from someone they don't know and then allows that person access to their private communications, the law is unlikely to find an expectation of privacy".

James continues to pursue her drug kingpin. In 2009, her office began to monitor his associates' cellphones and text messages. Investigators also slipped inside the organisation's stash house to do what's called a sneak-and-peek. They found 3 kilos of cocaine, 16 bricks of heroin, \$80 000 in cash, two pistols and an AK-47. Police later rounded up members of the organisation. But when they tried to catch the kingpin in the parking lot of a shopping mall, he took off, vaulting over a fence and a 2,4 m wall, then disappeared into traffic.

Last year, James heard that one of the drug dealer's friends was sending encoded messages from his Facebook page to let people know the kingpin was all right, but she went to that page and found nothing. What she really hopes to find is the dealer himself, lurking, like her, behind some false online persona.

"He's sneaky. There's no way he'd use his own name on Facebook," James says. "But I scroll through his friends' lists looking for things like his son's name, which is unique." James hasn't found him yet, but she's confident that the online conversation will ultimately prove too hard for him to resist.

Names have been changed, as this is an active investigation.

PM

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DEEP

down under

Photographer and

So much of the ocean is still a mystery, and nowhere more so than in its inky depths, which can be reached only with special pressure-resistant vessels. BBC cameraman David Shale began his career as a deep-sea oceanographer with the Institute of Oceanographic Sciences, but it wasn't until he worked on the TV station's landmark series, *Blue Planet*, that he began thinking about photographing the animals down there.

Accompanying scientific expeditions to the remotest parts of the ocean, he uses special tanks and the latest technology to photograph a host of unusual life forms after they are brought to the surface. In this way, he has helped document a number of species that are completely new to science. Photographing deep-sea animals is extremely challenging, he says, and maintaining the correct conditions can entail working long hours in extremely uncomfortable conditions. But according to Shale, seeing the animals first-hand, collecting them and photographing them, is the "ultimate experience". Here's his story...

MANY MOONS AGO, after leaving university, I joined the Institute of Oceanographic Sciences as a deep-sea oceanographer. I worked first on "neuston" (the term for all animals and organisms that float on the surface of the open ocean), then on pelagic molluscs, and finally on deep-sea copepods (small crustaceans). I helped develop the net sampling gear, too.

Then I decided to leave all that and make films for television. I worked for eight years at Oxford Scientific Films before going freelance and contributing

to many wildlife documentaries for *Survival* and the BBC. When I worked on the latter's landmark *Blue Planet* series, many of my old colleagues were still there, and it resurrected my interest in these animals. Technology had developed so much since my early photographs of deep-sea animals. It didn't exactly make my job easier, but it *did* offer me different and more diverse ways of solving problems.

After *Blue Planet*, I was invited on a number of oceanographic cruises, mainly in the North Atlantic. I also had the



Piglet squid (*Helicocranchia* sp.) photographed at night at a depth of 200 to 500 metres, is arguably among the most charming sea creatures, its unusual pigmentation making it appear to smile.



Enteropneust (Acorn worm), photographed at a depth of 2 700 metres. Many acorn worms are detritus feeders, extracting their nutrients from sand or mud.



Head and bioluminescent lure of the deep-sea dragonfish, *Eustomias tetranema*. Below: A portrait of the equally scary fangtooth (*Anoplogaster cornuta*). This fish is actually quite small and harmless to humans (primarily because humans rarely venture to its preferred depths).

adventurer David Shale shares some of his favourite 'eccentricities' from the ocean depths.

DEEP down under



Glass squid (*Teuthoidea megalops*). The species has the ability to engorge itself with seawater when threatened, thus presenting a more formidable presence to predators.

opportunity to dive in submersibles and collect animals. This is the ultimate experience... to see the animals first hand at depth, collect them and photograph them aboard a research ship in special tanks.

If you are a terrestrial biologist with an interest in, say, reptiles, you simply have to travel to the location, find the animals and photograph them. With deep-sea fauna, you need the services of a special oceanographic vessel. When filming, you get respect from scientists if they see that you understand the science and the animals. I do... it's my life, too.

I even have a say in the depth at which we seek out the fish and target different fauna – and this could be a kilometre or more below the surface. I'm given lab space to set up my specialised equipment: a variety of aquaria of different sizes, depending on the size of the specimens. Since all my specimens are small (usually measuring less than 25 cm, and many less than 10 cm), I consider them as macro subjects, so small

tanks are essential. I also use a *kreisel*, a specialised tank for living animals that I need to capture the images on stills or video. It's a 1 m-diameter circular tank equipped with a filtered and pumped seawater system, and it lives in a cold room at a temperature of 5-10 degrees Celsius.

This is where the dedication to my craft kicks in... spending up to eight hours at a time in a very cold room on a rolling ship in the dark! It's my niche, if you like – and I want to exploit it. As great jobs go, I wouldn't swap mine with anyone.

● In 2004, David Shales worked on the MarEco expedition for the University of Bergen in Norway, which subsequently produced a travelling exhibition called "Deeper than Light". The opening was held at UNESCO headquarters in Paris. This led to the publication of a similarly titled book. More recently, he contributed photographs for a highly acclaimed book by Claire Nouvian titled *The Deep*. **PM**

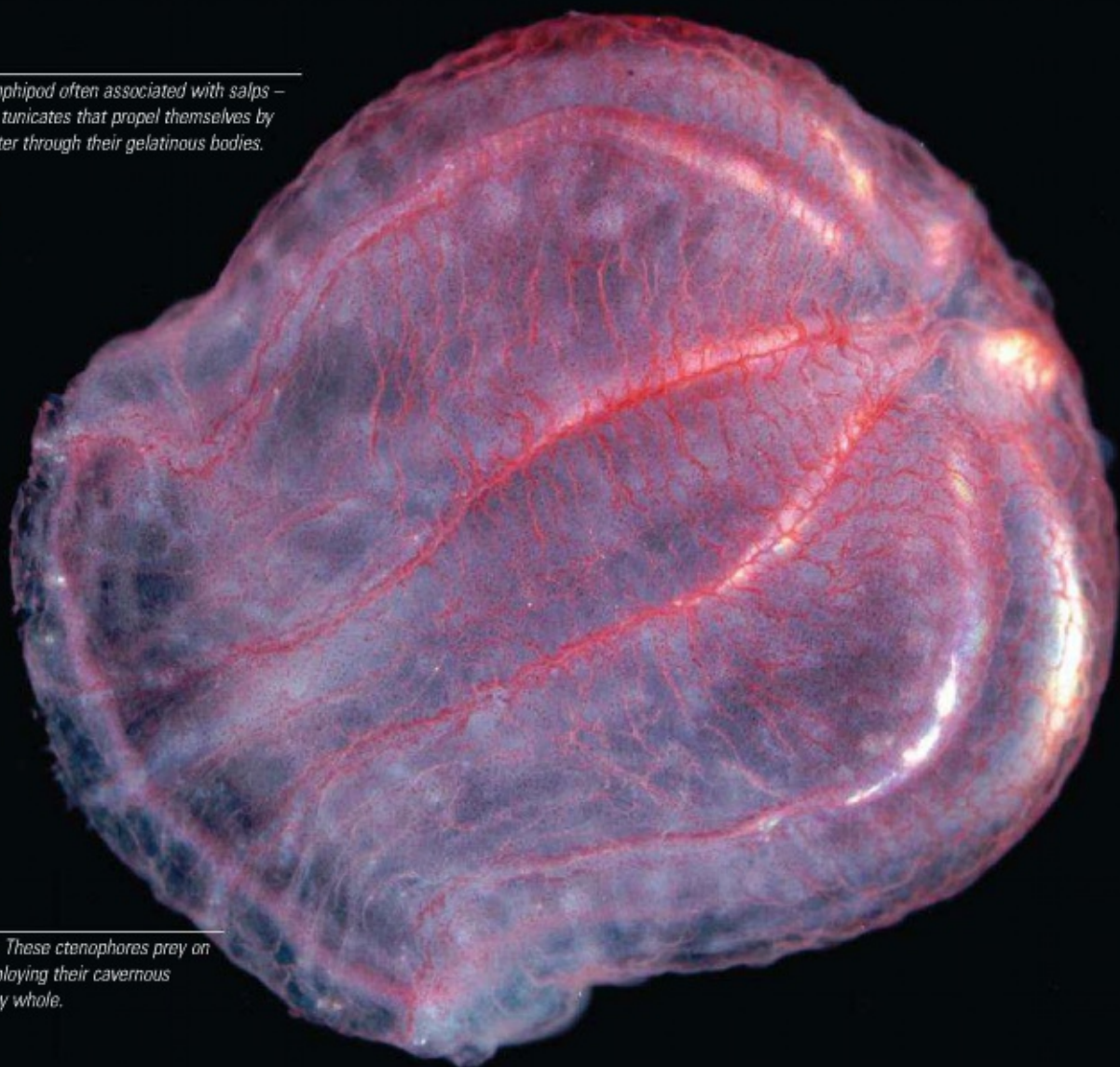


Deep-sea octopus (*Benthoctopus johnstoniana*).





A pelagic amphipod often associated with salps – free-floating tunicates that propel themselves by pumping water through their gelatinous bodies.



Comb jelly (*Beroë* sp.). These ctenophores prey on other comb jellies, employing their cavernous mouths to swallow prey whole.



Hydromedusan jellyfish.



Neolithodes, a benthic deep-sea crab.

The Cover Story/David Steele



Today, electric motors challenge piston-engine dominance, but back in 1963, Chrysler had another idea – a turbine-powered car.

Almost the future

> BY JAY LENO

> PICTURES BY
JOHN LAMM

The 1964 New York World's fair featured a very special car, the Chrysler Turbine. I made the trip from Massachusetts with my parents just to see it. At the fair, there was a long line of people around the block, waiting for a ride.

The gas turbine engine made a jet-like wooshh noise as the car went around and around in a little circle. But I didn't get a ride. My dad said, "We're not waitin' in line all day just to ride in a god-damn cah." I've always remembered that.

Just 55 Turbines were built. Chrysler held on to five for evaluation and made 50 available for testing by 203 families nationwide who were chosen from 30 000 volunteers. Each family kept the car for three months. As part of the deal, the drivers recorded impressions and mileage in little logbooks. Chrysler had a special

team of mechanics on call that flew out and fixed the cars right away if anything went wrong.

The families who tested the Turbines were treated like rock stars in their towns. It was a time when kids went crazy for cars; I still meet guys who remember where they were when they saw a Turbine go by. The test programme lasted 27 months, and everybody who tried the Turbine liked it.

The car was the brainchild of chief engineer George Huebner, who began studying the feasibility of turbine-powered vehicles in the mid-1940s. The engine's smoothness and durability seemed to be a practical alternative to the piston engine. It has few moving parts – just fan blades on a shaft separated by a combustion chamber – one spark plug and no cooling system. A compressor at the inlet pressurises in-



VIDEO

> Take a closer look at Leno's Chrysler turbine-powered car on www.popularmechanics.co.za



Above: The turbine was rated at 97 kW and 575 N.m, and routed power to a standard TorqueFlite automatic. **Left:** Finned cylinders are not for the exhaust – spent gases exit under the car – they're jet-age taillights.

fin. Nobody cared about alternative fuels when petrol was 27 cents a gallon, so the diesel fuel that the Turbine required wasn't easy to find. You had to go to a truck stop or drive around to the back of a filling station to the diesel pump, and it was smelly No 2 diesel – the same as heating oil – not the nice, clean diesel we get today. Back then, drivers didn't like diesel fuel because it was dirty and messy, and the pump handle was always greasy.

With a few simple adjustments, the Chrysler Turbine actually runs on nearly any fuel. In France, the tank was filled with Chanel No 5. In Mexico, at the request of the president, it was run on tequila. The Turbine was demonstrated all over the world, and people wondered, "Wow! What's America going to do next?" It was a really inventive time, when the best stuff came from the US.

Of course, there were a lot of myths associated with the Turbine. Years later, one automotive editor wrote, "Other than setting the grass on fire and melting the asphalt, they were great cars." I called him on it, and he admitted, "I just assumed a lot of heat was coming out the back."

I said, "No, the whole genius about the Chrysler Turbine was they invented a regeneration feature that made the exhaust cooler than a piston engine's." The engine temperature is 760 degrees, but two spinning regenerators force hot exhaust gases into the incoming airstream. Using regeneration kept the exhaust temperature down to 60 degrees.

The high cost was one reason the Turbine never made it into series production. Back then you could buy a V8-powered car for \$5 000, or this jet-engine car that would have cost around \$16 000. They had about equal performance, and the Turbine car wasn't especially efficient. On the highway, you got about 13 litres/100 km, which was not bad. But in town, idling at 22 000 r/min, it used a lot of fuel. So, given the choice, most people would have said, "I'll take the V8."

Between 1949 and 1981, Chrysler built seven different generations of turbine test vehicles. The company's shaky finances, the challenge of reducing the engine's NO_x output, the oil embargo and the need to downsize cars for front-wheel drive all hurt the Turbine's chances. I think it's the most collectible American car – it was so different. Most of all, the Chrysler Turbine is a reminder that all the cool stuff used to be made in the US. I hope it will be again. **PM**

coming air, which then combines with fuel and ignites. The expanding charge spins the turbine section that is geared to the output shaft. The car was rated at 97 kW and 575 N.m of torque at stall speed, about the same as a contemporary 5-litre V8.

Huebner built a few ordinary-looking prototypes in the '50s, but the pilot-programme cars would be driven – and seen – by the public, so Elwood P Engel crafted an all-new, futuristic body. Before joining Chrysler in 1961, Engel had worked at Ford, where he designed the 1958 Thunderbird; hence the Turbine's resemblance. The unit bodies were hand-built by Carrozzeria Ghia in Turin, Italy, and shipped to Detroit for final assembly.

In 2008, I finally got a chance to drive one, when I bought mine from the

Chrysler Museum. It's one of only three that are still operational. Most were destroyed by Chrysler for tax and liability reasons, which is a shame, because to this day everyone who rides in a Turbine says, "Whoa, this feels like the future!"

You turn the key and there's a big woosh and a complete absence of vibration. Put it in Drive, and you just press the accelerator pedal and go. It's like taking a '60s-era Buick Electra or Cadillac up to 100 km/h, then putting it in neutral and coasting. There's a tachometer, but you're idling at 22 000 r/min! It's reasonably quick, but not a rocket, and the engine is so well integrated that anyone can drive it.

One aspect of the car that really hurt it back in 1963 was that drivers couldn't use the most widely available fuel: leaded petrol. Tetraethyl lead eroded the turbine

4 G



AN EARLY ADOPTER'S GUIDE

Today's video-streaming, video-conferencing smartphones have an almost insatiable appetite for data. These devices don't just sip bits, they gulp them down in a movable feast of apps, video and Web browsing.

But all that data has a downside: surfing the once-wide-open 3G free-ways can now seem like slogging through rush-hour gridlock. At times, even basic tasks on a smartphone can bring you back to the dial-up days, when Web pages took minutes to load.

Enter 4G. With promises of cable-modem-like speeds, these next-gen networks could change the way we use mobile devices. The first 4G networks are up and running in certain parts of the world. When 4G eventually reaches South Africa, should we think twice before signing the two-year contract?

> BY SETH PORGES

> PICTURE BY DAN SAELINGER

> ILLUSTRATIONS BY MR MAZE

So what is 4G?



First, a bit of history: 3G has been available since 2003. In the USA, these networks came in a jumble of competing standards from various carriers, offering download speeds ranging from 300 Kbps to 1.5 Mbps and turning phones into true data devices. South Africa's enhanced 3G standard, also called 3.5G, using the HSDPA (enhanced high speed downlink packet access), offers speeds over 20 Mbit in selected areas.

The first 4G network in the US rolled out in select cities in 2008, and 4G gained serious momentum last year as more networks came online.

As you might expect, the higher the Gs, the greater the speed. (Those Gs, by the way, stand for "generation" as in "third generation", "fourth generation", etc.) But that doesn't mean there's a standard definition of what constitutes a 4G network. Like "natural flavouring" and "new and improved", the 4G label is as much marketing as technology. "What defines 4G is a matter of opinion," says Roger Marks, chair of the Institute of Electrical and Electronics Engineers broadband wireless working group. "There is no formal authority that decides what 4G is."

As a result, cellphone networks have resorted again to a variety of different – and completely incompatible – technologies, all stamped with the 4G label.

Semantics aside, users can expect to get a substantial speed boost by switching to 4G. In recent testing, we found the 4G networks able to achieve real-world speeds ranging from 5.8 Mbps all the way to 24.3 Mbps.

REAL-WORLD TORTURE TEST

When it comes to the 4G future, speedy Web browsing is just the beginning. To see how the carriers' new networks handle higher-performance tasks, PM editors Glenn Derene and Seth Porges put the networks through a battery of tests designed to push them to their limits – and beyond.



HD VIDEO TEST

To evaluate how 4G handles video, we used a Sprint mobile hotspot to stream Netflix to an Xbox 360. The result was stunning HD video – at first. After a few minutes, Netflix bumped us down to standard def (interrupting our movie). Minutes later, it was back up to HD, and then down again. Seems like 4G isn't yet ready for home-theatre heavy lifting.



HOME ROUTER TEST

Can a 4G network really replace a home wireless router? To find out, we set a houseful of Wi-Fi gear on a mobile hotspot running a 4G WiMAX network. Our test gear included a Netflix-streaming TV, two video-streaming computers (one playing YouTube, the other handling Hulu) and a Web-surfing iPad. On their own, each of these devices worked, at least intermittently. But when used all at once, Netflix skipped down from HD, Hulu lowered its frame rate to once every few seconds and YouTube slowed to a crawl. Bottom line: we'll be keeping our cable – at least for now.



How does it work?



Like 3G before it, 4G offers up an alphabet salad of standards. For the US market, Verizon is using LTE (Long Term Evolution); Sprint, in partnership with Clearwire, is behind WiMAX (Worldwide Interoperability for Microwave Access); T-Mobile is using HSPA+; and AT&T is offering a combination of LTE and HSPA+.

Each technology has its advantages. Verizon's and AT&T's LTE signals live primarily around the 700-MHz band, used for analogue TV broadcast. These relatively low-frequency signals can travel long distances and reach deep into buildings, meaning LTE devices should get a stronger signal in places such as basements and elevators.

The WiMAX network operates in the higher-frequency 2.5-to-2.7-GHz band. According to the IEEE's Marks, WiMAX antennas should be able to handle more data traffic; this extra capacity should help avoid the sort of network overload that often chokes up and slows down today's 3G networks.

HSPA+ networks offer less potential bandwidth than WiMAX or LTE, but they are easier to deploy. Because HSPA+ is essentially an upgrade to existing infrastructure, it will result initially in a far larger footprint than the select cities and airports typically covered by WiMAX and LTE.

Which technology will prove best? It depends on how 4G evolves. LTE is the

fastest now, but that may not matter if it gets overcrowded with data-hogging users. And if plans to expand the footprint of LTE and WiMAX stall, the slower HSPA+ networks may come to seem like a smarter bet.

Which gadgets use 4G?



So far, there are three basic types of 4G devices: smartphones, USB modems and mobile hotspots that harness 4G service to create portable Wi-Fi networks for multiple devices. (Mac users, watch out: some of the USB modems we tested are Windows-only – check before you buy.) None of these devices can replace a home Internet connection yet (see "Home router test"), but our tests showed 4G speeds to be, at their best, good enough to tackle most high-bandwidth tasks, including streaming video from a variety of sources, such as Netflix, Hulu and YouTube.

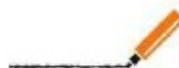
There are also a number of laptops and tablets with 4G access built in. Although they may seem less expensive than a Wi-Fi-only version of the same device, they typically require users to sign a multiyear contract, which can add up to thousands of dollars. And unlike a USB modem or mobile hotspot, their connections cannot be shared by multiple devices.

Since 4G network coverage can be limited, most 4G devices have the ability to

fall back on a slower 3G network. This safety net isn't just useful for people who find themselves outside of cities covered by 4G – even in 4G service areas, we found that devices frequently lost the speedier connection and got bumped down to 3G.

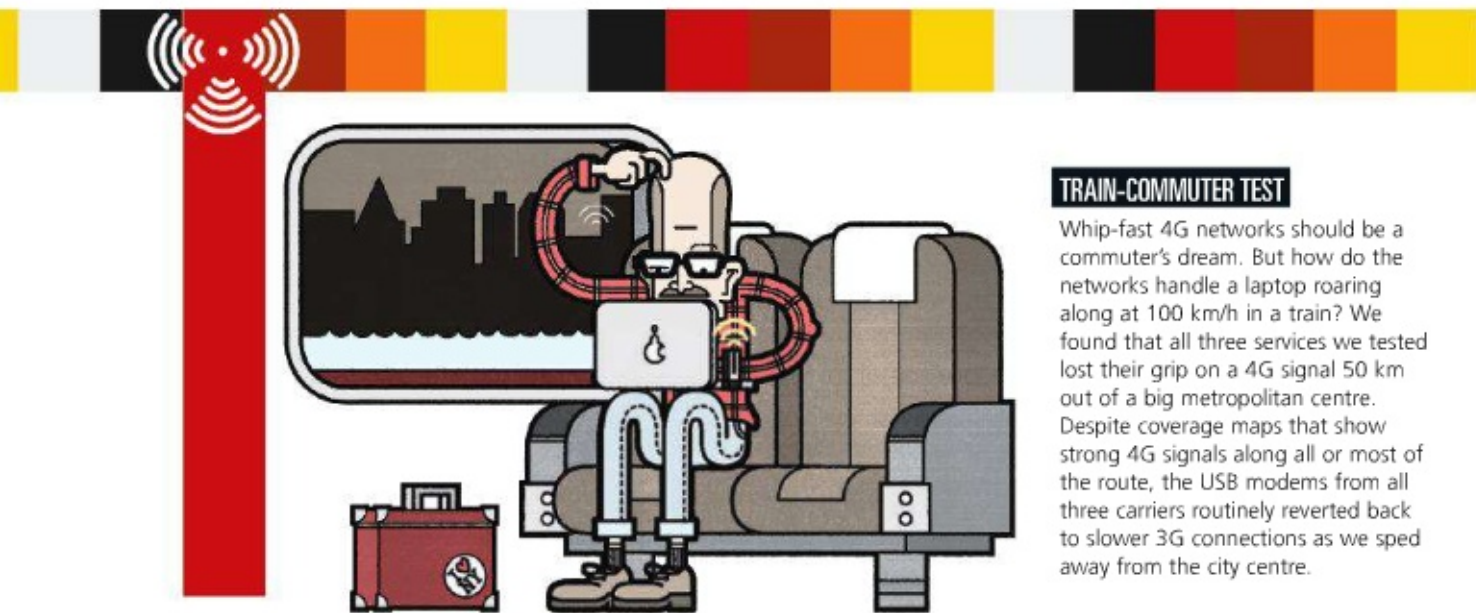
The 4G networks are power hogs that can strain a phone's battery. "As 4G chipsets mature and we see more multi-core devices, battery life should improve," says Ross Rubin, executive director of industry analysis at market research specialists the NPD Group. Until then, many 4G phones give users the ability to switch off 4G to preserve battery life – something we found ourselves doing to get through a day between charges.

Bottom line



Sexy devices and fast networks are great – if you can stomach the monthly bill. The thing is, the cost of 4G can sneak up on you, even in the fiercely competitive US market. Zooming past a data cap can cause fees to add up quickly. One network charges \$10 (£70) per gigabyte over its data caps. And the high speeds of 4G put those caps within surprisingly easy reach: just 3 hours of HD Netflix streaming will get you to the 5 GB monthly limit.

The drawbacks of 4G are many – limited equipment, spotty coverage, confusing



TRAIN-COMMUTER TEST

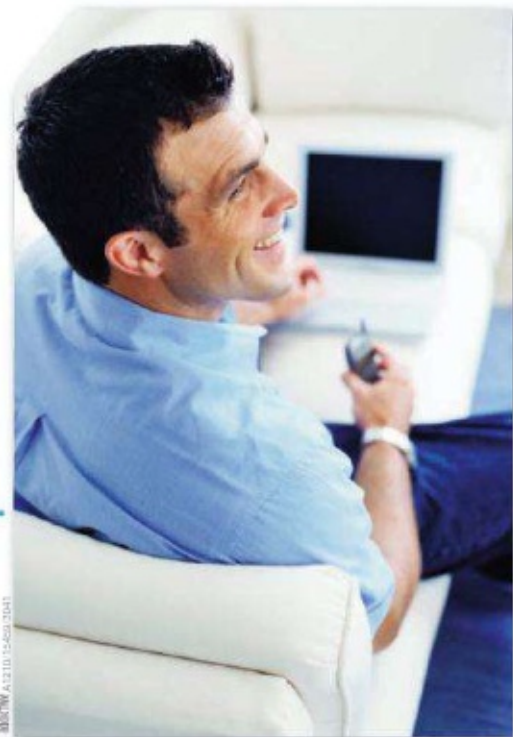
Whip-fast 4G networks should be a commuter's dream. But how do the networks handle a laptop roaring along at 100 km/h in a train? We found that all three services we tested lost their grip on a 4G signal 50 km out of a big metropolitan centre. Despite coverage maps that show strong 4G signals along all or most of the route, the USB modems from all three carriers routinely reverted back to slower 3G connections as we sped away from the city centre.

plans – but temporary. Yet 4G networks do offer one huge benefit to early adopters: because these networks are new, they are still running under capacity. If

you're lucky enough to live in an area with coverage, using a 4G device today is like driving a Lamborghini on a new highway with light traffic. And that may

not last. If the history of 3G has taught us anything, it's that when carriers build capacity, users will come. **PM**

People in the know, **know**



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TURN ON, TUNE IN WITH LIVE HUB ↖

With the launch of their WD TV Live Hub media centre in South Africa, industry leaders Western Digital are raising the bar by a couple of notches. You get a full-HD 1080p media player with a 1-terabyte built-in network hard drive that allows you to play all your personal media on any screen across a wide variety of media file types, including full-HD 1080p video formats such as .mkv, .mp4 and .mov.

The compact and quiet hard drive enables you to centralise your digital media from multiple sources for glitch-free playback of even the highest-resolution videos. Digital media can be transferred to the internal drive from shared folders on PCs and Macs on the network or directly from external hard drives, flash drives, camcorders or cameras connected via one of the two USB ports. You can also stream videos from home network drives using a DLNA/UPnP server

such as the recently announced My Book Live home network drive.

There's more. The media centre allows you to stream HD video, music and photos from the hard drive to any DLNA/UPnP-compatible TV or multimedia device in the connected home, including the WD TV Live Plus HD media player, connected TVs, Blu-ray disc players, Xbox 360, and PlayStation 3 game consoles. And you can stream content to iPads, iPhones or Android smartphones using third-party applications.

Are you socially connected? The media centre offers useful Facebook integration: upload photos and videos, share your status, view your friends' walls and get the latest newsfeed from your network – all on the big-screen TV. Oh, and it's Wi-Fi ready.

The WD TV Live Hub media centre is available from various retail outlets for about R2 000.





SERIOUS SOUND ⇅

Okay, we know this is way over the top, but you need to know that the new L'Ocean speakers from specialist firm Cabasse produce a remarkable 117 decibels of distortion-free sound. How loud is that? Well, if you were to think about standing close to a jet while the pilot warms up the engine, you'd be in the ballpark.

What makes these speakers different from those awful things you find in mobile boom-boxes is the fact that they are seriously classy. They are also large and heavy, weighing in at about 80 kg apiece and putting out an astonishing 2 250 watts. Each of the tweeters accounts for 250 watts. Among its more compelling features is a controller that uses a microphone to adapt the speakers' response to the acoustics of the room where it's being used.

Price? Don't expect any change from R800 000.



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If you offer two highly successful product lines, it makes perfect sense to merge them. In this case, we're talking about SoundSphere and Fidelio from Philips, a marriage aimed at bringing music-lovers a full-fidelity listening experience. By all accounts, combining the functionality of the Fidelio docking speaker with the sound quality of SoundSphere results in a thoroughly satisfying listening experience.

Apple's AirPlay technology allows you to seamlessly play music over a home Wi-Fi network from iTunes on Mac and PC, iPhone, iPad and iPod touch without needing to plug in cables or dock your device. The Philips Fidelio SoundSphere delivers sound in all directions for a deeper and wider audio impression with minimal interference.

It will be available in Europe later this month at a price of around R800.

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An NVIDIA GeForce 320M graphics processor provides outstanding speed and power for browsing photos, watching movies or playing games. It also makes the everyday things you do with your notebook – such as writing an e-mail and surfing the Web – both fast and energy-efficient. Your MacBook Air comes with pre-installed Mac OS X and iLife, and all of this is packed into an elegant case weighing just 1,06 kg.



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✓ UNCHAIN YOUR LIFE

Music is a natural part of your daily life. So why should you be chained to a desk when you want to experience it? With the inMotion Air, you can listen to room-filling sound on your computer anywhere in your home. Just connect the USB transmitter to your computer, choose your playlist and take the inMotion Air wherever you need to go.

The wireless transmitter sends your computer's audio through the air and into your speaker up to 100 m away. You can also pair the speaker to your iPod touch, iPhone, iPad and most other stereo Bluetooth devices for added musical freedom. The rechargeable battery provides up to seven hours of playing time. A no-brainer, in other words.

YES, BIGGER IS BETTER ↘

In some branches of technology, the smaller the appliance, the cooler its image. In the case of TV sets, however, it's an entirely different ballgame. This neatly introduces a product billed as the world's largest full LED 3D television, the 72-inch LZ9700 from LG Electronics.

You get large (think life-size) pictures, an immersive 3D viewing experience and a raft of new technologies to enhance your experience. If you like, you can stream videos from YouTube and images via Google's free Web photo service, Picasa, using LG's intuitive "Magic Motion" remote to control everything.

Further connectivity is available in the shape of a smart DLNA function, which allows you to wirelessly access files stored on other media devices to enjoy on the big screen. It costs a bomb, though: expect to cough up R250 000.



WAY-VEE ACTION →

An exciting new approach to PC entertainment on show at the recent CeBIT 2011 event was the WAVI Xtion (pronounced "way-vee action"), comprising two components – the WAVI wireless media streaming device and the Xtion motion sensor. This nifty device enables you to stream high-def media wirelessly from a PC located in one room to a TV in another, while infrared gesture-based multimedia playback, games and applications introduce the first ever officially supported motion-sensing PC interface.

WAVI Xtion integrates motion-sensing technology from PrimeSense with the Asus Xtion Portal user interface, bringing intuitive interaction with applications. Connections to both PCs and TVs via wireless HDMI deliver high-def content such as movies, games and photos in 5 GHz with a range of up to 25 metres.

Software products include MayaFit Cardio Lite, a motion-sensing fitness training game, and BeatBooster, a multiplayer racing adventure game where users manoeuvre jet aircraft with their body movements. Enjoying PC games on the living room big screen TV is also possible; the Xtion engine

supports the remapping of keyboard controls into motion gestures for a variety of popular third party games.

It doesn't end there, either. The WAVI Xtion enables a wide selection of multimedia content and entertainment applications, working seamlessly with the *Asus@vibe* online store to deliver music, games and apps – all through the cloud.



SCORE ONE FOR THE COUCH POTATO ↓

So you see no earthly reason why you should get up off your chair to play computer games and perform other useful tasks? Good for you... it's all about your constitutional right to grow obese in the comfort of your home. Just kidding: what we really mean is that IOGEAR's innovative 2.4 GHz wireless on-lap keyboard with optical trackball and scroll wheel gives you the comfort and freedom of wireless connectivity between you and your PS3 or other game console, your home theatre PC, computer and HDTV (you can probably count on a range of about 10 m). Contoured with comfort in mind, it rests comfortably on your lap and allows you to interact with your content easily and efficiently. An additional left-click button permits precise single-handed navigation.

No driver is needed; just plug in the included USB RF receiver and you're ready to go. It costs less than R800 in Europe.

PM



WIN

one of 8 LG ARX-8000 Home Theatre systems with either HDMI DVD or Blu-Ray

Loud bass. Crystal-clear melody. Big sound. Get it all with the new, powerful LG ARX8000 AV receiver with HDMI connector. In a stylish glossy black design, it boasts a total of 800 watts, with 5.2 channel surround sound speakers presenting a maximised sound field and reduced interference. The horn compression tweeter increases power output by 50 per cent compared with a normal driver, and the dual subwoofers pump out a combined 300 watts.



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Life's Good



To experience the ultimate in sound, you have the choice of either:

↓ **LG DVX492H DVD player:** HDMI connectivity, USB port for movies, music and photos, as well as DivX HD playback.

↓ **LG BD550 Network Blu-Ray disc player:** works with external hard drive, the ability to play various formats, and a clear detailed image via HDMI.



7 x ARX8000 with DVX492H worth **R3 999**

1 x ARX8000 with BD550 worth **R5 999**

You could win

To enter, answer the following question:

What is the total output in watts of the ARX8000 AV receiver?

SMS: LG followed by the answer, your name and e-mail address to 34419 (R2 per SMS) or visit our Web site at www.popularmechnics.co.za. Competition closes 31 May 2011.

For more information on the products, visit the LG Electronics Web site at www.lg.com/za

Rules:

1. Entry is open to anyone except employees (and their immediate families) of Ramsay Media, LG and associated agencies.
2. Only one online entry per person. You may enter via SMS as many times as you like (SMS charged at R2).
3. Competition runs until 31 May 2011.
4. We will draw the winner(s) on 10 June 2011.
5. The prize is not redeemable for cash.
6. The judges' decision is final and no correspondence will be entered into.
7. Regrettably, only South African residents are eligible for prizes.
8. Prizes not claimed within 3 months will be forfeited.

**Popular
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Invisible

BRAINS

Computing intelligence is moving into everything, everywhere, from domestic kitchens to family cars, from retail stores to electricity boxes. Interestingly, it works best when no one sees or even thinks about it.

It may have escaped your attention that computers are everywhere. They control or at least influence the way we work, communicate, unwind, go places, buy things, entertain ourselves... even the pursuit of our relationships.

In keeping with the dictates of Moore's Law, the chips that make them work continue to get smaller and smarter. And when you put a lot of them together, they create the stuff of science fiction – all of which helps to explain why Intel no longer sees itself as “just a chip company”.

Dr Martin Curley, director of Intel Labs Europe and a frequent international speaker on innovation and technology, looks forward to the arrival of “exascale” computers, incredibly powerful machines capable of 1 million trillion floating point operations per second. A step in the right direction came last year when Intel, imec and five Flemish universities opened the Flanders ExaScience Lab in Leuven, Belgium. The lab will develop software to run on Intel-based future exascale computer systems delivering 1 000 times the performance of today's fastest supercomputers, using up to 1 million cores and 1 billion processes to do so.

Breakthroughs in exascale computing will allow scientists to simulate very complex systems such as the human body or Earth's climate, hopefully resulting in cures for diseases and a more accurate prediction of natural disasters, including “space weather” – electromagnetic activity in the space surrounding Earth's atmosphere.

It makes perfect sense for companies

like Intel to explore new applications for their rapidly advancing technology. Take their new Thunderbolt high-speed connection, for example. Developed in collaboration with Apple, and running at a formidable 10 Gbps/second, the cable is capable of transferring a full-length HD movie in under 30 seconds. That's seriously fast, but it doesn't end there. Their developers are already working with the industry on a number of Thunderbolt-enabled products, including computers, retail displays, storage devices, cameras, audio-video devices, docking stations, and more.

But it's the realm of embedded computing that has produced some of the most innovative solutions such as adiVerse, a virtual footwear wall that puts an entire aisle of shoes at your fingertips while you are in-store and ready to buy. Powered by 2nd-generation Intel Core i7 processors, it allows you to interact with the footwear at an unprecedented level of detail.

We tried it during a recent visit to the Intel Embedded Lab in Shannon, Ireland – and it found it strongly compelling. Using touchscreens, you select a 3D-rendered product on a virtual shelf, examine it from any angle, rotate it, zoom in, choose a different colour, or request further product and technology information. Then, when you're ready to buy, you do so via a tablet-based checkout. So you're choosing a pair of running shoes for your offspring? No problem – this clever machine allows you to e-mail image and other relevant information for approval.

There's more. Built-in (anonymous)



Above and opposite: Multinational company Capgemini recently introduced its Home Energy Dashboard, a device that enables utilities to interact directly with consumers in their homes. It allows them to better manage their demand response programmes by shifting residential customers' peak usage without impacting on their comfort, by offering them preferential tariffs as they seek to reduce energy consumption, and by delivering new services such as solar panel monitoring, electric vehicle battery management and storage management. But it goes a lot further: in effect, the panel becomes the home's command centre, displaying the weather, recording family video messages, arming the security system, indicating energy consumption and setting the house temperature.



Top: A demonstration of the adiVerse virtual footwear wall, a form of interactive merchandising that eliminates the need to display 1 000-plus varieties of sports shoe. Shoppers can browse among virtual shelves, examine their selection from all angles and call up technical details on each product. Built-in anonymous video analytics provides metrics on shopper trends, demographics and shopping patterns, enabling the manufacturer to provide personalised experiences and relevant value-add services. Above, right: The “interactive fashion experience” gives new meaning to mix 'n match.

video analytics provides metrics on shopper trends, demographics and shopping patterns, enabling the manufacturer to provide personalised experiences and relevant value-add services to shoppers. The result – an emotional connection with the shopper, strengthened brand loyalty, repeat shopper visits, and increased sales.

In similar vein, Intel’s “interactive fashion experience” offers an endless aisle that allows the shopper to visually access thousands of fashion items, combine them into outfits, share them with friends, and finally make a purchase. Although this form of shopping requires a big – and possibly insurmountable – leap of faith, it remains a good indicator of how computing technology could be incorporated into the shopping experience.

Ger McNamara, who heads up the digital signage market in EMEA countries, believes the “invisibility” and reliability of the underpinning technology (that is, out of sight and out of mind) are more important than the psychology of the customers, explaining: “Consumers get upset only when something doesn’t work.”

Having acknowledged the ubiquity of the computer chip, we ask Ton Steenman, vice-president of the Intel Architecture Group and general manager of the Embedded and Communications Group,



WHO ARE YOU, ANYWAY?

WIN One of three DNA tests that will reveal your deep ancestral origins

Have you ever wondered where your ancestors came from? Are you curious about the migration patterns of the ancients, and the maternal and paternal lines that helped create you?

The answers may be closer than you thought. POPULAR MECHANICS is pleased to announce the launch of **Know Yourself**, a competition that will provide one female and two male readers with an opportunity to have their DNA tested and analysed. Working in collaboration with the Texas-based company, Family Tree DNA, we will uncover clues in your DNA that you can use to determine your ancestral origins and even find those long-lost relatives.

Acknowledged as a world leader in genetic genealogy, with a database ranking as the largest of its kind in the world, Family Tree DNA will conduct the Y-DNA37 and mtDNAPlus tests for the two male winners to identify the deep ancestral origins of both their maternal and paternal lines, using samples provided via simple test kits. Depending on the uniqueness of the sample tested, the results will also point towards a more recent geographic region or country of origin.

The female winner will receive just the mtDNAPlus test, which identifies the deep ancestral origins of the direct maternal line only, without influence from other lines. Once again, depending on the uniqueness of the sample tested, the analysis may determine a more recent geographic region. You also have the option of joining a rapidly growing network of genealogical researchers across the world, resulting in the discovery of relatives in unlikely places.

What does the test involve?

It couldn't be easier. The kit consists of three swabs, three tubes, instructions, and a release form that allows Family Tree DNA to share your name and e-mail address with your matches (voluntary). Each swab has a cotton "toothed" tip, and using it feels like brushing your inner cheek with your toothbrush; a good scrape produces lots of DNA. The tubes contain a fluid that prevents bacterial growth, so you can test and return your kit in any type of weather, hot or cold.

If you like the sound of all this, now's the time to get cracking.

To enter, answer the following question:

What's the name of our DNA test competition?

SMS: DNA, followed by the answer, your name and e-mail address to 35172 (R3 per SMS) or visit our Web site at www.popularmechanics.co.za. Competition closes on 31 May 2011.

Note: The results of your DNA test will be sent directly to you. We'd like to chat to you about it, but if you would prefer to keep the information to yourself, that's entirely your own business.

Rules:

1. Entry is open to anyone except employees (and their immediate families) of RamsayMedia and associated agencies. **2.** Only one online entry per person. You may enter via SMS as many times as you like (SMS charged at R3). **3.** Competition runs until 31 May 2011. **4.** We will draw the winners on 06 June 2011. **5.** The prize is not redeemable for cash. **6.** The judges' decision is final and no correspondence will be entered into. **7.** Regrettably, only South African residents are eligible for prizes. **8.** Prizes not claimed within 3 months will be forfeited.



Popular Mechanics
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whether his company is exploring the possibility of an embedded bio-friendly chip... perhaps a first step towards the merging of human and machine, as envisaged by futurist Ray Kurzweil.

"Not yet. Right now, we are concentrating on making the user-machine interface more natural. A big focus inside Intel is creating a *consistency of experience*."

Expounding on the immersion of computers into our everyday lives, Steenman envisages a person being woken in the morning by a computer-controlled cell-phone alarm, getting into a computer-controlled car, driving to the airport past a computer-controlled billboard, stopping at a computer-controlled traffic light, checking in for his computer-controlled flight, drawing holiday cash from a computer-controlled ATM... you get the

This page: Some of the demonstration units at the Intel Embedded Computing press event. Among the more interesting technologies was the Digital Signage Endcap Concept (top left). Consumers use gesture control to learn more about a product, order an informational video tour in real-time, obtain price comparisons, secure promotional coupons and even sync with their smartphones. As they move to within 3 m of the display, sensors pick up their presence, gender and approximate age, then feature an appropriate video tour to help with their product selection.

picture. He's not naïve about the concomitant risks, though, adding: "With connectedness comes responsibility in respect of privacy and security. We obviously have face recognition capability, but our tech is anonymous by default."

Energy – controlled through a multitude of applications, including so-called "smart grids" – is another important area of research in the Intel community. Steenman presents a possible scenario for the near future: meteorologists forecast the imminent arrival of a storm over Ireland with the potential to produce large dollops of electricity from offshore wind farms.

The power utility offers consumers a chance to buy special low-cost electricity coupons via their cellphones. They take up the offer and use the coupon to charge their electric cars overnight at a reduced rate. Thanks to the storm, everyone scores.

By the year 2015, says colleague Jonathan Walsh, we will be surrounded by 15 billion embedded devices.

Bring it on.

PM

'The key to building a reliable engine is patience. The details matter and everything has to be just right – especially to produce a lot of horsepower.'

ENGINE REBUILDING IN FIVE STEPS

1. Disassembly

During disassembly, Mikkelsen relies on hand tools so he can feel a stripped thread or loose bolt. "A lot of times an engine blows a head gasket because a head bolt was loose," he says. A careful tear-down reveals the engine's failure mode and wear characteristics. He sorts parts according to their position on the block. Another tip: "Start from the top."

2. Cleaning and inspection

Elbow grease and an automated steam cleaner remove built-up crud. To reveal tiny cracks in a part, Mikkelsen magnetises it, applies a magnetic fluorescent powder to its surface and illuminates it with a black light. The powder collects inside cracks that are invisible to the naked eye.

3. Machining

After carefully measuring every part, Mikkelsen works pieces that are out of spec or worn with grooves – like a scored crankshaft – back to proper dimensions. Warped heads like the one pictured are ground back to flatness. Mikkelsen often finishes surfaces by hand.

4. Ensuring accuracy

After machining, Mikkelsen again pulls out micrometers, a straight-edge and bore and feeler gauges to inspect and measure every part. "Seventy-five per cent of my time is spent measuring," he says.

5. Reassembly

As with disassembly, Mikkelsen uses only hand tools to reassemble the engine. He vacuum tests the heads to check the valves and uses assembly dressing so parts are lubed at start-up. Then he fires every engine on an engine stand. "Hearing an engine fire for the first time never gets old."

PM

ENGINE BUILDER

Name: CHANCE MIKKELSON

Age: 23

Years on job: 4

Chance Mikkelsen learned his trade the old-fashioned way. "I built my first engine – a Chevy V8 – with my dad when I was 14," he says. In 2007, Mikkelsen opened his own shop, Dexter Manufacturing, and works on engines of all vintages and size. "One day I'm assembling the heads of a Maserati V8, and the next I'm resleeving a lawnmower cylinder." During off-hours, he might be fabricating a fuel-injection system for a Ford Model A. Often, he completes projects for frustrated DIYers. "When guys buy a bunch of go-fast parts," he says, "the engine rarely runs right. You have to figure out which parts work best together. That's the fun part." – LARRY WEBSTER

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SUPER

SHEDS

Builder: Mike Christie-Fogg **Floor area:** 23 m²

Why the shed is super: Visually stunning, agriculturally functional, made from salvaged materials and popular with the neighbours' goats, Christie-Fogg's greenhouse and potting shed prove that one man's trash can become another's treasure.



A musty hole to hold the mower. A cluttered cubby for a derelict dirt bike. A dank hovel hiding rusty lawn chairs. We call such modest structures sheds, whether they're pre-fab plastic bubbles or pre-cut plywood boxes. But it's okay to expect more from a shed – a lot more. Here, we highlight prime examples of new, aspirational outbuildings that put ready-made shacks to shame. These super sheds are the homes of the blacksmiths, bike clubs, gardeners, brewers and builders with projects too dear to take place in any old hutch.

> BY AMANDA DEMATTO



Matthew Montcalh



Heart of the garden

Hops for home-brewed beer dry in the shed Mike Christie-Fogg built from discarded materials he found on job sites and roadsides. "I'm a pack rat for recycled materials," he says. "I'm trying to tone it down so I don't have big piles of garbage lying around."

While remodelling a 1940s Ford dealership near his home, woodworker Mike Christie-Fogg hit the lumber jackpot. A collection of big beams, rafters and solid 20 mm pine flooring had to come out. It was a couple of hundred square metres, and they were going to trash it. Christie-Fogg helped himself to the clean, old-growth wood. "I could have made furniture out of it, but then I thought, I have enough to make an entire barn."

The plan came together after he drove his Toyota Corolla past a pile of antique win-

dows put out as garbage. He returned with his truck, loaded up the glass and went home to create a 5 x 3 metre barn with a 3 x 2 greenhouse.

Now, he germinates seedlings there in spring, and in summer, tomatoes ripen among rows of shovels. In autumn, he starts onions, kale, broccoli and beets in the barn, then moves the plants to a heated nursery. He also dries the hops he uses to brew a dark Dunkelweizen beer.



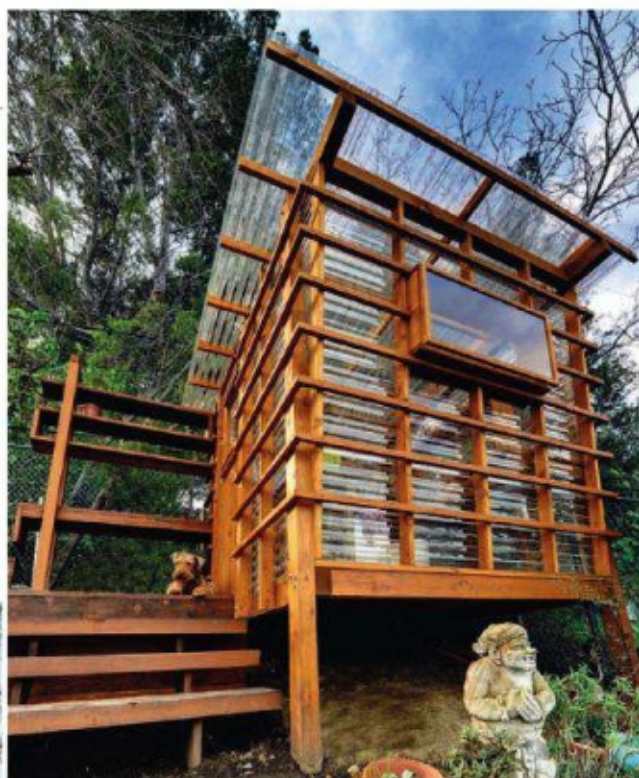
Hilltop paradise

Builder: Jeffrey Tohl

Floor area: 6 m²

Why the shed is Super: Though it has some luxurious appointments, such as a hot tub in the deck, the shed stays humble with its modest scale and low-cost, practical materials, such as corrugated plastic panels and stock redwood lumber.

As a gift for his wife, architect Jeffrey Tohl built a potting shed overlooking Los Angeles and the San Gabriel Mountains.



Jeffrey Tohl graded his steep hillside plot in Studio City, California, into a cascade of terraces connected by footpaths and stairs. From the courtyard behind his house, Tohl ascends to a vegetable garden and orchard with peach, lemon and pomegranate trees. Even higher – 19 metres above the sidewalk – sits a redwood greenhouse anchored by

Val Rolo



1,2 m x 2 m posts set in concrete. Tohl built the super shed as a gift for his wife. "Terracing allowed us to have a variety of landscape environments," says Tohl, who's an architect by trade. "The greenhouse is secluded, rustic and private, but you have this amazing 200-degree view."

To make sure his wife could enjoy the view while tending to succulents and herbs, Tohl designed a rectangular casement window that offers a panorama of the landscape and the mountains in the distance. He added a Dutch door so the room could feel open without inviting the family dog to trample the seedlings. To hold down construction costs, Tohl stuck to inexpensive materials, such as corrugated plastic panels for the walls, and joined the crew to finish the job in just two weeks. Fast work, especially considering the shed's hilltop site: "Everything had to be carried from the street – infill, concrete, lumber ... It was a colossal undertaking."

SUPER-SIZE YOUR SHED



Heat it Adding a heat source raises safety concerns and makes for more complex permitting. That said, wood stoves are a popular choice, in part because they're available in sizes to suit just about any shed. Ceiling-mounted electric heaters reduce clutter.



Wire it Always specify wiring in your shed plans when applying for building permits. Expect to have to install a subpanel to serve the shed's circuit breakers. From that panel, run armoured wire underground; where it emerges from the ground, sheathe the wire in a slip coupling to allow movement, but prevent abrasion.



Plumb it Or maybe not. Building inspectorates often consider plumbing part of a habitable structure, as in a small house. A water-free composting toilet can work, but it requires installing a roof vent and running a drain line to an external tank that must be amended frequently with wood shavings and cleaned out twice a year – a dirty job.

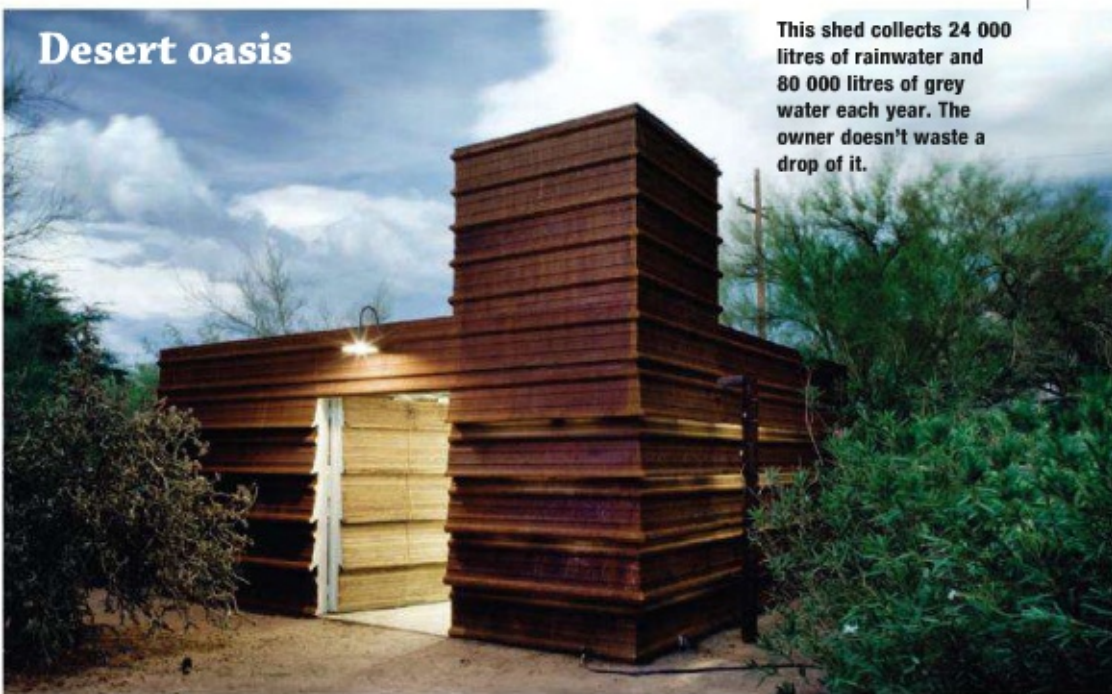


Light it Study the natural light patterns on the shed site before building, and position any windows or skylights so work surfaces receive afternoon sun. Design ceiling-hung, wall-mounted and exterior path lights along with the wiring plan.



Insulate it For multiseason shed use, retrofit stud and rafter bays with glass fibre batts, sealed under drywall or 6 mm plywood. In a new shed, plan extruded-polystyrene subslab insulation to prevent the cold from creeping in through the floor.

Desert oasis



This shed collects 24 000 litres of rainwater and 80 000 litres of grey water each year. The owner doesn't waste a drop of it.

Just 32 cm of rain falls annually on Tucson, Arizona. To collect as much of it as possible, Ben Lepley used reclaimed lumber to build a 37 m² water-storage shed in his parents' yard. The structure began as a 2 500-litre tank he and his brother fashioned from a discarded 1,2-metre-diameter steel culvert. Lepley poured a concrete bottom in the tank and rigged gutters and drains to feed into the cistern. The tank fills to capacity when a little more than a centimetre of rain falls, he says. But while giving a drink one day to thirsty desert plants and native fruit trees, Lepley discovered that the hose ran dry while the tank was still half full. He solved the problem (and gained 3 400 litres of capacity) by adding a sump pump and a second tank, using gravity to increase the system's water pressure. He also expanded the liquid-collection network to draw in grey water from the showers and washing machine. "All the water gets pumped up to the water tower, and then it's ready to use around the yard," Lepley says. Switches inside a vertical gutter pipe automatically shut off the pump to avoid overflow, and a homemade depth gauge, made from a buoy, shows the quantity left in the tank.

Blacksmith's barn

"The feeling you get from taking a piece of steel, heating it and then forming it at will is just indescribable," Mark Suchocki says.



Matthew Menzies



Builder: Mark Suchocki

Floor area: 53 m²

Why the shed is Super:

At Suchocki's Black Dog Forge, hammering a 1 000-degree iron bar on a 131 kg anvil is a typical day in the shed.



Ever since Mark Suchocki built his first coal forge, in 1999, he's been hooked on blacksmithing. "The first winter, I'd go through knee-deep snow to get to the forge," he says.

The forge sat for a year behind his house in northern Massachusetts. But after a below-freezing point day froze the water in his slack tub, he decided enough was enough – and in the fall of 2000, he spent \$5000 to build a 7 x 7 metre smithy with a steel roof and earth floor.

"You have a hot side of the workshop and a cold side," he explains. The hot side holds the forge, anvils, fly press, chisels, tongs and punches; on the cold side, you'll find the storage racks, assembly table, sanding station and bar twister. Suchocki actually crafted many of the hammerheads and chisels that line the smithy's walls. "You know you're a blacksmith when you use one tool to make another," he says.

Bikes in a box

Derrick Pacheco's Phoenix bike shop proves the minimalist credo that less is more. He paid \$1700 to have a 2,4 x 6 metre shipping container delivered to his backyard in the summer of 2010. After he spent three months and several hundred dollars insulating and wiring the box, it became a bike shop, and a magnet for the city's two-wheeled community. One neighbour with a broken axle scored a wheel from Pacheco's stash for small change. Another brought in his mom's 1948 Schwinn Hornet, brushed with blue house paint, in need of restoration. After finding the replacement parts, Pacheco repainted and revived the classic. "The old Schwinn is a head-turner," Pacheco says. "We take care of the customer for the life of the bike. Since I decided to make bikes my career, it has been everything bike – all day!"

On Pacheco's assembly line (below right): a brazing station, spare tyres and power tools aplenty.



Derrick Pacheco



'I DON'T NEED BLUEPRINTS, I JUST KNOW HOW TO USE A HAMMER.' — MICKEY WEBER



Lynn Weber

No plans, no problem

Micky Weber built a 13 m² garden escape, working off a sketch made by his wife, Lynn. "I don't need blueprints," Weber says. He made a jig to assemble cedar-framed barn sash windows, and the couple laid a hose 60 metres across the lawn to direct water from the house into the shed through a reverse garden-hose coupler.

Lynn managed to spiff up a bargain-priced plastic utility sink from a retail megastore by switching out the standard fixture with a high-neck copper tap. "We also mounted the sink on a cupboard," she says. "Now everyone thinks it's a porcelain sink."

Cedar siding, matching roof shingles and a purple-martin birdhouse cupola grace the exterior. "When we built it, over the summer of 2007, a lot of people stopped to see what the heck we were doing," Lynn says. "The day we moved it into place, people were driving by, honking, cheering and yelling, 'It looks good!'"

The Webers' homemade barn sash windows have leather-lace fasteners; an open cupboard adds a built-in look to the gardener's utility sink. PM

CAR CARE

> BY MIKE ALLEN



Countdown

→ GM cars use a complex algorithm to calculate remaining oil life. Engine temperatures, crankshaft revolutions and other factors all influence the oil's usefulness.

Oil be damned

Q How much should I trust the oil-life monitor in my Chevy? Would you feel comfortable waiting until it says that there's 5 per cent oil life left, or would you change it earlier – at, say, 30 per cent? Or should I just stick to an 8 000-kilometre change routine and adjust for harsh driving conditions?

A GM's Oil Life System is actually far more than a simple distance tracker, and usually, it's very effective. Usually, it works by counting crankshaft revolutions and recording engine parameters such as hot and cold engine temperatures as well as a number of other factors, depending on the engine family. The purpose of all of this is to predict when the ZDDP (zinc dialkyl dithiophosphate) anti-wear additive in the oil is exhausted, at which point engine wear accelerates. ZDDP prevents metal-to-metal wear in areas where the oil film may not be adequate and extreme pressures – such as the pointy end of camshaft noses sliding over flat tappets – force the film completely out from between sliding metal surfaces. There's far more to engine-oil exhaustion than ZDDP levels, but GM has found it's the single largest predictor of oil condition.

Unfortunately, the algorithm can't account for a leaky air cleaner that lets in airborne dirt, coolant weeping into the cylinders, a tankful of bad fuel, excess crankcase condensation from a stuck

thermostat or a hundred other mechanical woes not related to the oil itself. Oil contaminated with dirt, water, coolant, bypassed exhaust gases or unburned fuel – none of which can be accounted for in GM's algorithm – will accelerate engine wear.

GM's method is good, but it's potentially more accurate to directly measure the oil's condition rather than simply infer it. Mercedes' system uses a sensor that determines the dielectric constant of the oil, a measure of the oil's ability to resist electrical fields. (Dielectric constant by itself has no bearing on the actual capacity of the oil to protect your engine, but as the oil is contaminated with dirt, wear particles, water and partially burned hydrocarbons, it changes.) BMW uses a simpler resistance-based sensor. These systems are more attuned to measuring the contaminants that build up in the oil, rather than being concerned with the depletion of ZDDP. There are other systems in commercial use, but the common thread is that they have a better chance of finding used-up oil than GM's predictive algorithm does.

On the other hand, if you're confident that everything under your bonnet is going according to plan, the GM Oil Life System can be a useful tool, and I'd wait until the Oil Change message appears or the percentage of oil life left is a single digit before changing the oil and filter. The day of the pre-emptive 5 000-kilometre oil change is dying fast.

Sticky fingers

Our 10-year-old pick-up has an airbag in the steering wheel. The plastic covering has turned into a gooey mess. It's sticky, and the black colour comes off on anything that touches it. This is the only part of the dash that has this problem, so it's obviously made of a different material to the rest of the interior. Do you know of any way to reverse this problem? Since it's an expensive replacement item, we don't want to do anything that would make it worse or make it fail.

The vinyl cover has started to depolymerise from environmental factors. That goo is the vinyl plastic and its plasticisers breaking down, and there's really no fix for it other than to replace the vinyl cover. It's a different grade of vinyl because, unlike the dash and door panels, it has to burst open easily to let the exploding airbag out. One manufacturer we consulted said such covers are separately serviceable in only a quarter of an hour without replacing the airbag module. Unless you've been trained at

deactivating airbags, don't attempt this repair yourself.

Voltus interruptus

I don't get all the hype about the Chevy Volt. Let's do some math here. First, the battery stores 16 kilowatt-hours of electricity, and the Volt can travel 55 kilometres until the battery is drained. Once the petrol engine kicks on and the Volt enters the charge-sustaining mode, the car gets roughly 7,6 litres/100 km. Comparing US prices of petrol with those of electricity, the Volt costs only about R7 more to go 55 kilometres.

So what is the point of all of this engineering, complicated circuitry and heavy batteries? Shed the weight of the batteries and electric motor and I bet the fuel economy will improve enough to equal the EV per-kilometre cost. Not to mention the hours it takes to charge the batteries. Why don't they just build a fuel-efficient small-petrol-engine car and drive it?

Your point is well taken. Except that the Volt uses only roughly half of its 16-kWh battery pack. The Volt's battery-management system doesn't fully charge or discharge the pack, to optimise battery life and achieve GM's 10-year battery guarantee. So travelling 55 EV kilometres expends only 8 kWh, not 16. Factor in 10 to 15 per cent losses (as heat) during the recharge cycle and you'll draw about 9 to 10 kWh for a full recharge. I checked your figures for fuel and electricity cost and they're off quite a bit; actually, using petrol to propel the car will cost nearly three times as much per kilometre as using electricity.

All EVs and PHEVs are similarly careful with their batteries because deep-discharging or fully charging substantially reduces battery life. Your numbers might make sense if the cost of petrol drops and electricity goes up. I'm guessing petrol will continue to creep upward. And as it does, the Volt and its kin will make more sense.

As always, your mileage may vary. One example would be the Mazda2 currently in PM's press fleet, which consistently delivers economy of around 6,5 litres/100 km in gnarly commuting without the benefits of any hybrid gewgaws. Chevy's Cruze, built on the same platform as the Volt, is comparable. I think for many potential Volt owners, it's an opportunity to investigate the edge of the technology envelope. And don't forget, just as the Prius has become more efficient with every generation, so will the Volt.

Pushover

While I was in university in the late '60s to the early '70s, we had a flood. A friend



TOOL OF THE MONTH

STAYIN' TOGETHER



Chemical threadlockers are a great boon. They keep nuts from coming loose at inopportune moments, like braking into a turn at 200 km/h or losing the hitch ball on the trailer at 4 am on a deserted country road. Traditionally they've taken the form of a liquid or gel, which is applied to the threads as the parts are assembled. Loctite's **QuickTape 249** is a threadlocker that comes in tape form. And it's applied just like Teflon pipe tape – two wraps are plenty. Now you can assemble the part or wait as long as a month. QuickTape 249 makes working in tight places or overhead simpler, because the chemical stays put. And it's just as effective as the old-fashioned liquids.

Picture by Marc Aurin

drove his early-'50s standard-transmission Chevrolet van (with the three-speed on the column) through the water, which got into the clutch and locked it up. He could start it in gear, but when he stepped on the clutch, it would not disengage. If he started it in neutral, he could not put it into gear. He was quoted an astronomical price by a garage to remove the transmission and take the clutch apart.

After thinking about it for a while, we jacked one rear wheel of the van up on his bumper jack. I told him to start the van in second and push the clutch in and hold it down to the floor. Then I told him to keep the clutch pushed in and rev the motor a little above idle. I then just pushed the van off the bumper jack. The jarring when the wheel hit the ground broke the rusted clutch loose. His eyes just about popped when he realised that he did not have to remove the clutch or transmission.

And I'm guessing that that van had a host of other problems within a few months – stuff like a failed pilot-shaft bushing, a failed throw-out bearing, rusty brake linkage and other issues – as a result of the water infiltration.

Actually, it's not uncommon for clutches to seize up on cars that have been parked for too long, especially in damp areas.

Here's a better way to break one loose: find a big, deserted parking area or country road. Drive along at high revs in bottom gear and hold the clutch pedal to the floor. Lift off the throttle abruptly, then press the throttle to the floor. Repeat the on/off throttle action a few times. I've never needed more than a half-dozen stabs at the pedal to free one up.

Think about it: you can't put more torque on the clutch than the wheels have grip. Knocking it off the jack only gave you one shot at breakaway. My routine adds multiple shocks, and in alternating directions.

Oh, yeah – it's safer too.

Water crisis

I have a problem with corrosion around the overflow tank for the radiator. When I had the dealer drain the cooling system I gave him 10 litres of distilled water to use instead of tap water. Is this a good idea?

Yes, but if your water isn't very hard it's not necessary. If you do have hard water, it'll help. Another option is to buy pre-diluted coolant. I prefer to flush the last bit of old coolant out of the engine with distilled water, though. Then add the right amount of undiluted coolant, and top it off with more water.

PM

TORQUE WRENCH BASICS

There's only one tool to make sure that fasteners are tightened properly – not too tight or too loose. > BY MIKE ALLEN



Wheel lugs are probably the most common type of torque application.

➔ Breaking loose all five overtightened lug nuts required totally discharging two full batteries in my cordless impact wrench – obviously, the last person to install that wheel had overtightened the nuts with a powerful pneumatic impact wrench. I installed the lug nuts on the spare with a torque wrench, carefully adjusted to the correct 135 N.m, which I looked up in – wait for it – the owner's manual. That process got me the stink eye from the car's otherwise grateful owner – who was convinced that the proper way to tighten the lugs required that pneumatic wrench again, or at least jumping up and down on the end of the lug wrench. In spite of my insistence, I saw him from my living room window a half-hour later, tightening the lug nuts with the car's lug wrench, boosted by a 10 cm length of water pipe slipped over the handle. The squeak as the nuts turned those last few degrees was audible from across the street. Sigh.

TOO MUCH IS TOO MUCH

Car manufacturers specify a proper tightening level, a torque value expressed in newton metres (foot-pounds, in old-school terminology) for every fastener on your car. Torque is a rotational force applied around a point or, in this case, a nut. Put a 30 cm wrench on a nut and apply 10 newtons of force to the opposite end. You're now twisting that nut with 3 N.m (distance times force, or 0,3 metres times 10 newtons). Use a 60 cm wrench and apply 200 newtons of force, and you'll have about 135 N.m, which, happily, is just about as long as most lug spanners, and as much force as most elbows are happy cranking on.

While most mechanics rely on a well-calibrated elbow to tighten things, it's vitally important that the tightness of a fastener fall within a fairly narrow range. Too loose and there's the danger of the nut or bolt spontaneously unscrewing down the road. Or maybe the gasket or O-ring fitting clamped by that bolt will leak. Too tight and there are other risks: the bolted-together part may be compressed, bent or otherwise damaged. The bolt shank could break, or the threads

may strip, providing no clamping force at all. The best way to tighten fasteners is with a device called a torque wrench.

BASICS

Why don't we simply tighten every fastener of any particular size to the same torque value? Why do we need a workshop manual to tell us that one 8 mm bolt holding down a valve cover needs 15 N.m, whereas the 8 mm stud on the shock absorber needs 25?

Let's discuss what happens when you turn a nut or bolt head. The threads are a form of inclined plane or wedge, the simplest type of tool. As the inclined plane is wedged (turned) into the threads, it applies a force along the bolt's length, effectively making the bolt a tension spring. This tension in the bolt shank clamps two parts together. If the clamping force is greater than the load exerted between, say, the head and the block, those two pieces will never spontaneously get loose.

And the more twisting force you apply to the bolt head or nut, the more clamping force in the joint. So just tighten it until it won't come loose, right?

Wrong. Differences in overall bolt length, the material of the clamped parts, the presence of a gasket between the two parts, and even the alloy of the bolt itself affect the proper torque. Also, the proper torque value takes into account the friction between the threads, which is the single biggest variable that affects the relationship between the torque applied to the bolt head and the clamping force. Friction arises from the threads as well as the rotating bolt face scrubbing along the stationary workpiece. Overcoming friction can account for as little as a few per cent or as much as half of the force needed while tightening a nut or bolt. And that means that the clamping force can vary widely – not good when you're installing a cylinder head or an intake manifold.

TO LUBRICATE OR NOT

Most times, the specified torque value assumes clean and dry parts. Clean means no dirt, rust, dried-up gasket sealer or anything except shiny metal. Wire-brushing the threads will help remove rust or sealant. Engine fasteners, such as head bolts or main cap bolts, are often specified to be torqued with 30-weight engine oil wetting the threads and washer. If you're installing a fastener that has a dry torque spec, and the threads and bolt face are

oiled, you'll need to reduce the torque by 15 to 25 per cent, because the slipperier surfaces will decrease friction. Teflon-bearing lubes or moly-sulphide engine assembly lubes can reduce friction enough to require a 50 per cent reduction in tightening torque. Even casually substituting a zinc- or cad-plated bolt or washer for an unplated one calls for, respectively, a 15 or 25 per cent reduction in applied torque, because the plating acts as a lubricant. Fail to heed this advice and the fastener will be seriously overtightened. You'll either snap it or crush a gasket to the point where it leaks.

On the other hand, rust or burrs on the threads can increase friction enough that a fastener tightened to the specified value won't provide sufficient clamping force. The workshop manual will specify whether the fastener is supposed to be dry or lubed. In either case, prep your bolts. Don't forget that residue from the parts washer or that pie tin full of paraffin you're using to clean parts has oil in it. Even a quick blast of compressed air to dry off a fastener will leave an oily film behind, affecting ultimate torque. If you're really fastidious, clean up with some aerosol carb or brake cleaner, followed by more air. If you've used grease

or anti-seize compound to keep the brake discs from seizing to the hubs, take care not to contaminate the studs or lug nuts.

TORQUE-PLUS-ANGLE

Increasingly, critical fasteners such as cylinder-head bolts, engine-mount fasteners and intake plenum bolts require what's referred to as torque-plus-angle tightening. Due to inconsistencies in the friction between the threads and bolt face, conventionally torquing a fastener isn't consistent enough. A few percentage points of difference in friction, due to irregularities in the threads, a burr, rust or old thread sealer, can multiply into a huge variation in the fastener's tension. That can lead to spontaneous dismantling of the joint. The tightening spec for these fasteners requires two stages. The bolt head or nut is first tightened – in a normal crosshatch sequence if there are more than two – to a prescribed torque value; then, again starting with the first bolt, to a second, higher value. Only then should it be turned, in a single smooth move, an additional number of degrees. The only way to do this accurately is with the torque-plus-angle fixture (see illustration). The fixture's arm is clipped to some nearby



TOOLBOX

TORQUE TYPES

There are two commonly used types of torque wrenches. Choose a wrench whose upper limit is roughly double the value of most of the torquing you'll do – don't use a 0-to-350 N.m wrench to tighten valve covers to 10 N.m.

BENDING-BEAM

(1) This is the wrench for those who don't regularly need a torque wrench. The large centre beam bends as you apply torque, while the unbending pointer beam lets you read the torque directly. If it goes out of calibration, simply bend the pointer back to zero with a pair of pliers. The single biggest disadvantage is that

your eyeball has to be parked directly above the pointer while you read the scale, which is tough in hard-to-reach places.

MICROMETER "CLICKER"

(2) This pro-grade tool is preset to the correct torque and will click tactilely and audibly when it reaches the correct torque. It's highly



repeatable and accurate, but should be returned to zero after every use. Even so, it should be calibrated regularly if used for critical parts

such as suspension and internal engine fasteners. Don't use your torque wrench like a ratchet for disassembly – save it for final assembly.

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[WHEELS]



TORQUE-PLUS-ANGLE

Clip the protractor scale to any convenient stationary object. Torque the fastener per the manual. Zero the scale, then crank in the extra degrees.

object to anchor the protractor dial, which must be returned to zero after the initial torque is applied. Then the wrench is turned the specified additional rotation. Again, this should occur in the customary sequence for multiple fasteners.

Critical fasteners – cylinder-head bolts are the poster child here – are so difficult to properly tighten that, not only does the manufacturer specify torque-plus-angle

tightening, the bolt is a one-time-use item that has to be discarded if it's ever removed. These torque-to-yield bolts generally have a necked-down straight section between the threads and the bolt head. The initial torquing stretches the bolt along its length nearly to its limit of elastic deformation. If you unscrewed the bolt at this point, it would return to its original length. Apply the extra rotation and the bolt stretches to its plastic deformation region, where additional stretching of the bolt yields no additional clamping force but the bolt won't return to its original length later.

This method assures that all of the bolts clamp the two parts together with nearly identical force so critical things such as head gaskets won't leak. You're probably wondering why engineers don't simply specify larger bolts that can apply enough force without permanently deforming. Those larger bolts can be overtightened, and too tight is just as bad or worse than too light.

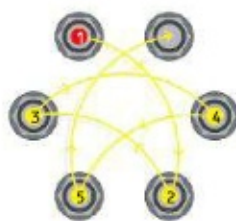
Finished torquing the wheels or cylinder head? Don't forget to save the torque wrench's calibration by returning the micrometer scale to zero before you stash it in your toolbox. **PM**



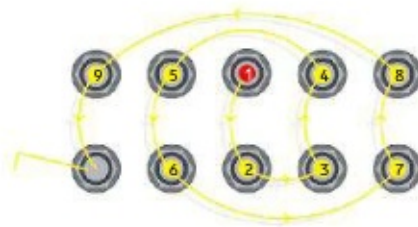
WORKSHOP TECHNIQUE

TIGHTENING PATTERNS

Whenever there are more than two fasteners securing a part, it's important to alternate the tightening among them. Here's the correct procedure: start all the bolts or nuts a few threads and then run them hand-tight. Often, the workshop manual will show a specific tightening sequence. Tighten mildly by hand, then to the torque spec.



1. Circular patterns of bolts, typically the lug nuts on wheels, should be tightened not in a circle, but in a crisscross or starfish pattern.



2. Larger, oblong parts such as cylinder heads often have a specific sequence for proper tightening, generally starting near the middle and circling around.

KNOW THE BOLTS

Markings on bolt heads designate the bolt's strength class. Don't ever use an ungraded bolt with a blank head on anything more highly stressed than a barbecue. SAE Grade 5/DIN 8.8 bolts are appropriate for most uses; SAE Grade 8/DIN 10.9 bolts are higher-strength fasteners for critical applications such as suspension parts and connecting rods. There are many special fasteners that have unique markings as well.



SAE Grade 5



DIN 8.8 Metric



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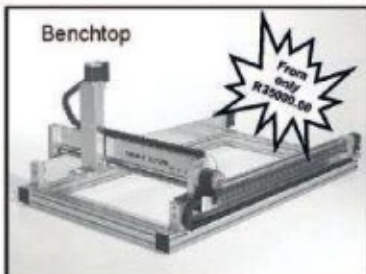
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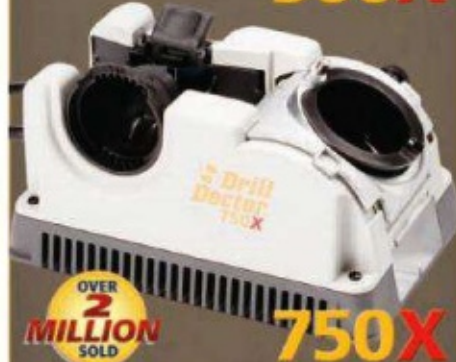
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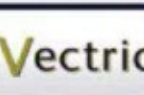
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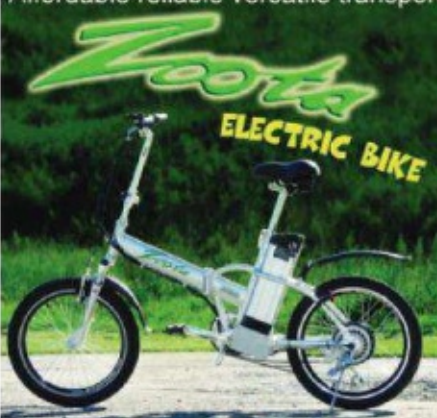


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Next, place your negative on the scanner glass, rest the Perspex on top and hold the scanner cover open to admit the light, then scan the negative. You might have to experiment with different lighting conditions to achieve the optimum result. Remember that the darker the negative, the lighter the image. Most editing programs allow you to change the file to positive.

RT COWLEY
DE LA HAYE

Slippery slope

If your ladder is prone to sliding along the floor, try putting socks over the feet to increase the friction and reduce the chance of a fall. Be sure to test this before you climb too high!

JOHANN OLWAGEN
VIA E-MAIL

Clamp with ease

Any handyman worth his salt has at least a couple of G clamps in the garage or workshop; they are the equivalent of a third hand. Here I'm referring to the metal clamps, typically made from cast iron or pressed steel. Unfortunately, on many of these, the moving face is a dished washer. The problem with this is that if you clamp soft material, you will damage the surface of the work piece, so you end up putting pieces of scrap material between the

work piece and the two clamping faces, which can be awkward.

My solution: file or grind the fixed clamp face flat and square to the axis of the clamp frame, then braze or weld a flat metal disc to the dished washer. In my case, it was well worth the time and effort required to modify the half a dozen G clamps.

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Tackle that oil spill

Whether you're cooking in the kitchen or servicing your car in the garage, you occasionally have a mishap and spill oil on the floor, creating a potential hazard. Dealing with this is child's play: simply pour maize meal over the spill and scoop it up after it has absorbed all the gungy stuff. It works just as well when you need

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LJ VAN ROOYEN
WIERDA PARK SOUTH

Bend it, shape it

Plasticine (the non-toxic modelling clay) can be used for a variety of things in a workshop. Here are some of my favourites: use it to make a small pool when drilling materials that require a lubricant; mould replacement parts; mould silicone stoppers and washers such as the ones under your toilet seat; fill pinholes in a plaster-of-Paris mould.

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LAKESIDE



Shiny side up

Do not underestimate the usefulness of aluminium foil. A friend recently used a few rolls of foil to make his own "light tubes" to bring natural light to his workshop. The results were amazing, and all it took was a can of spray glue and a Saturday afternoon. I had similarly good results a few months ago when I helped my son make a solar cooker; the foil is a bit fragile, but if you work carefully, it's not a problem.

MIKE PIENAAR
EAST LONDON PM

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